5.0 SOURCES AND TYPES OF RELEASE AND OTHER WASTE MANAGEMENT ACTIVITIES

This section provides an overview of the sources of on-site releases and both on-site and off-site waste management activities. It also discusses corresponding release and other waste management activity types as they pertain to the RY 1996 Form R. Errors and oversights in identifying potential sources of chemical usage can result in significant errors when estimating the quantity released and otherwise managed as waste. Similarly, misidentifying the type of release or other waste management activity can result in data being misclassified in the TRI database. This section analyzes the frequency and types of errors facilities have made in identifying the sources and types of release and other waste management activities. The analysis can help identify the reasons for certain systematic errors made by the regulated community, in general, and by the specific industries visited, in particular. Once the reasons are identified, EPA can take appropriate action to help facilities reduce the frequency of errors, and thereby increase the accuracy of the estimates.

This section considers the following topics when evaluating how release and other waste management estimates affect the quality of TRI data:

- Distribution of release and other waste management activity sources and release and other waste management activity types within each SIC Code (Section 5.1);
- Incorrectly reported release and other waste management activity types (Section 5.2);
- Overlooked release and other waste management activities (Section 5.3);
- Calculation methodologies (Section 5.4); and
- On-site waste management activities (Section 5.5).

Trends and corresponding qualitative discussions regarding observations made during the site visits are presented as applicable, and issues that are specific to individual industries or unit operations are discussed whenever possible. The information combined with the quantitative data presented in Section 6 will help determine the primary sources of error in data entered in the TRI database.

For the purposes of this report, "sources" mean the streams or unit operations that generate the potential release or other waste management activity (such as process vents, container residue, or spills) and "types" mean the ultimate disposition of the release or other waste management activity corresponding to elements in Sections 5 through 7 of the RY 1996 Form R (such as releases to fugitive air, releases to stack air, discharges to a publicly owned treatment works (POTW), releases to land, and transfers to off-site disposal). In most cases, this section presents data both in a tabular form for quantitative analysis and in a graphical format for qualitative trend analyses. Data are presented for RY 1996 for each of the three major SIC Codes visited (33, 36, and 37). A trend analysis between these SIC Codes has been conducted and a general comparison to the findings from previous survey efforts is made when applicable (see *1994 and 1995 Toxic Chemical Release Inventory Data Quality Report*, EPA 745-R-98-002, for details on results of surveys in SIC Codes 25, 26, 281, 285, 286, and 30).

5.1 Observed Release and Other Waste Management Activities

Table 5-1 presents the distribution of sources and the corresponding types of release or other waste management activity that was observed during the site visits for SIC Codes 33, 36, and 37. One facility may have multiple sources for a given type. Therefore, a "total" row is included to show the percent of facilities that had at least one source for the given type. Note that, for on-site energy recovery, on-site treatment, and on-site recycling, data were not available for distribution from specific sources. Figure 5-1a presents the "totals" by type of release and other waste management activity and Figures 5-1b through 5-1g present the data graphically by source for each release type and management activity. No transfers to underground injection were reported or observed; therefore, no corresponding figure is presented.

Site surveyors identified fugitive air releases at most facilities in these SIC Codes (59% to 74%). However, the percent of facilities with fugitive air releases was less than the percent observed in site visits conducted in RYs 1994 and 1995, when nearly all facilities had fugitive air releases. (Releases of 67% in SIC Code 30 and 80% to 100% in SIC Codes 286, 26, 25, 281, and 285.) A lower percentage was expected for the RY 1996 study, because fewer volatile organic chemicals and significantly more inorganic chemicals are processed and used in SIC Codes 33,

Table 5-1

Distribution of Sources and Types of Release and Other Waste Management Activities

Release or Other Waste Management Activity Type	Source	Percent of Facilities with Releases or Waste Management Activities		
		SIC Code 33	SIC Code 36	SIC Code 37
Fugitive	Volatilization from process areas	51.9%	64.3%	68.4%
	Pumps/valves/flanges	7.4%	21.4%	15.8
	Storage tank/stock pile losses	3.7%	28.6%	15.8%
	Housekeeping practices/waste cleanup	11.1%	21.4%	5.3%
	Accidental spills/releases	11.1%	14.3%	5.3%
	Volatilization from treatment areas	3.7%	0.0%	5.3%
	Other[a]	11.1%	0.0%	0.0%
	TOTAL Reporting Release from at Least One Source[b]:	**59.3%**	**64.3%**	**73.7%**
Stack	Volatilization from process areas	59.3%	85.7%	68.4%
	Pumps/valves/flanges	0.0%	21.4%	5.3%
	Storage tank/stock pile losses	3.7%	21.4%	15.8%
	Housekeeping practices/waste cleanup	0.0%	14.3%	5.3%
	Accidental spills/releases	0.0%	7.1%	0.0%
	Volatilization from treatment areas	7.4%	28.6%	15.8%
	Process discharge streams	0.0%	0.0%	5.3%
	Other[a]	18.5%	0.0%	0.0%
	TOTAL Reporting Release from at Least One Source[b]:	**63.0%**	**85.7%**	**68.4%**
Receiving Stream/ Surface Water	Housekeeping practices/waste cleanup	3.7%	0.0%	0.0%
	Accidental spills/releases	0.0%	7.1%	5.3%
	Waste treatment discharge streams	7.4%	0.0%	0.0%

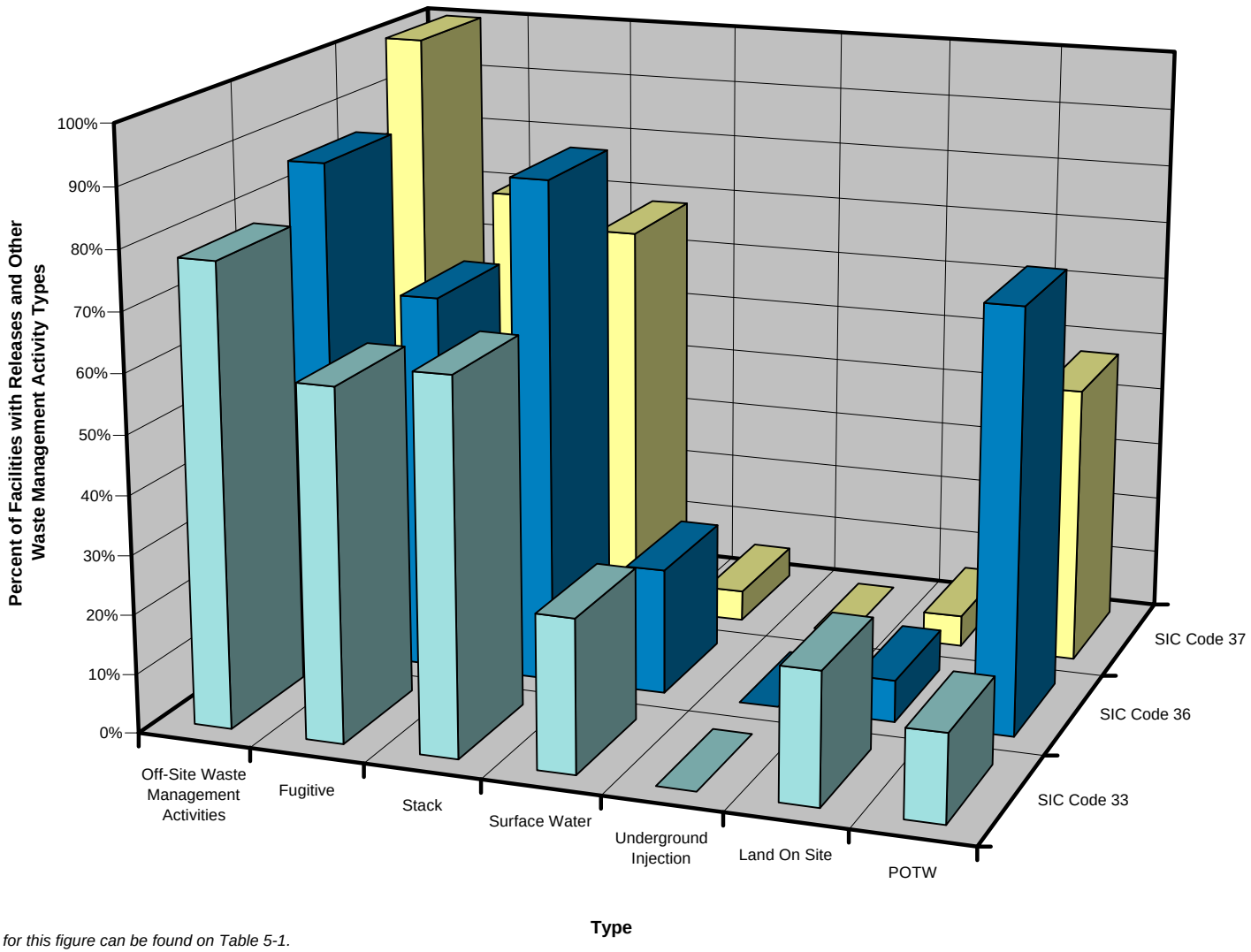
Table 5-1 (Continued)

Release or Other Waste Management Activity Type	Source	Percent of Facilities with Releases or Waste Management Activities		
		SIC Code 33	SIC Code 36	SIC Code 37
Receiving Stream/ Surface Water (Cont.)	Stormwater runoff	22.2%	21.4%	5.3%
	Process discharge streams	3.7%	0.0%	0.0%
	TOTAL Reporting Release from at Least One Source[b]:	**25.9%**	**21.4%**	**5.3%**
Underground Injection	**TOTAL Reporting Release from at Least One Source[b]:**	**0.0%**	**0.0%**	**0.0%**
Land On Site	Accidental spills/releases	11.1%	7.1%	5.3%
	Process discharge streams	3.7%	0.0%	0.0%
	Treatment sludges, recycling or energy recovery by-products	3.7%	0.0%	0.0%
	Other[a]	3.7%	0.0%	0.0%
	TOTAL Reporting Release from at Least One Source[b]:	**22.2%**	**7.1%**	**5.3%**
POTW	Housekeeping practices/waste cleanup	0.0%	14.3%	0.0%
	Accidental spills/releases	0.0%	21.4%	5.3%
	Waste treatment discharge streams	3.7%	64.3%	36.8%
	Stormwater runoff	3.7%	0.0%	0.0%
	Process discharge streams	7.4%	28.6%	26.3%
	TOTAL Reporting Release from at Least One Source[b]:	**14.8%**	**71.4%**	**47.4%**
Off-Site Transfer	Housekeeping practices/waste cleanup	33.3%	35.7%	31.6%
	Accidental spills/releases	11.1%	7.1%	10.5%
	Waste treatment discharge streams	25.9%	21.4%	10.5%
	Process discharge streams	70.4%	85.7%	84.2%
	Container residue	3.7%	7.1%	26.3%

Table 5-1 (Continued)

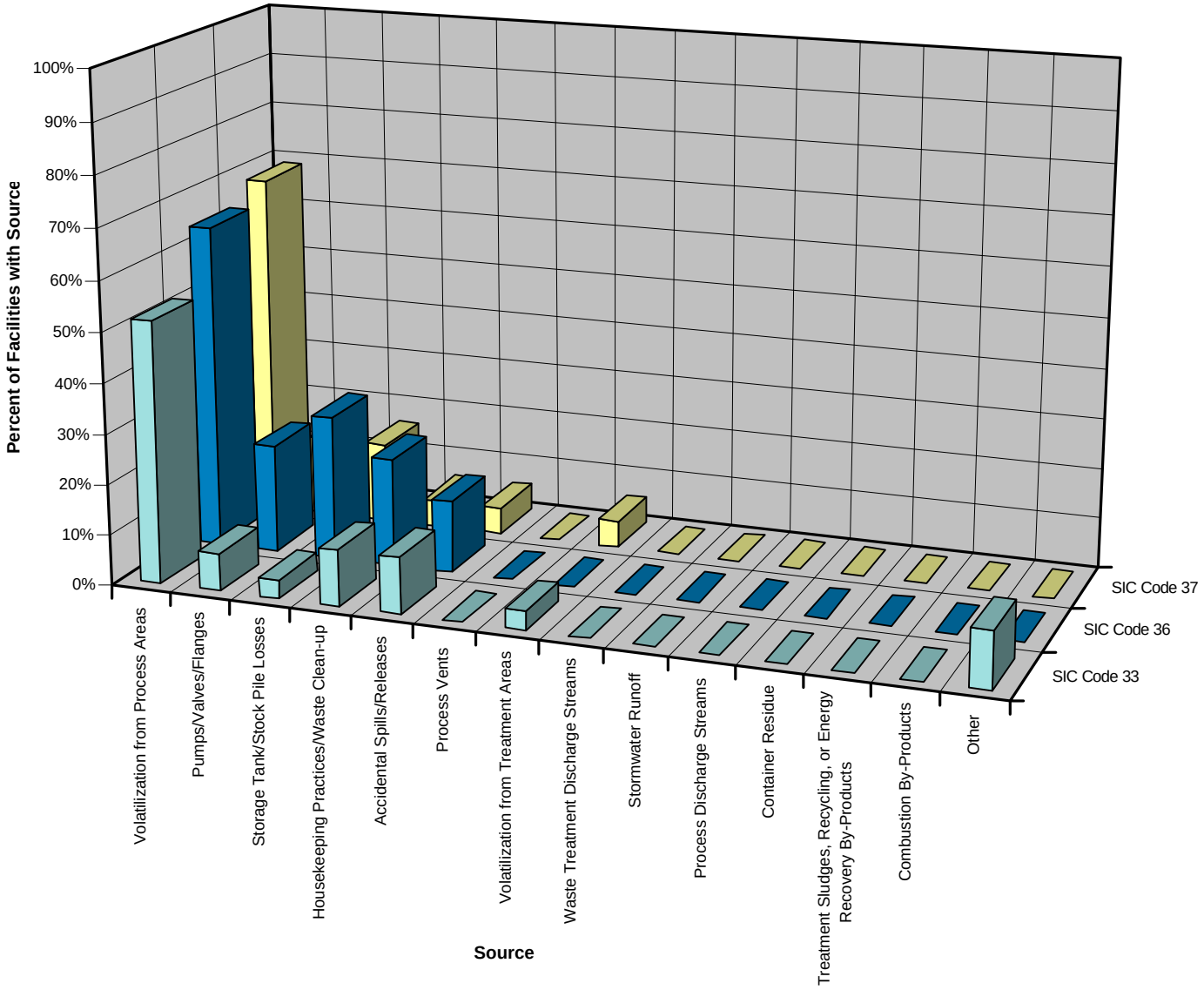
Release or Other Waste Management Activity Type	Source	Percent of Facilities with Releases or Waste Management Activities		
		SIC Code 33	SIC Code 36	SIC Code 37
Off-Site Transfer (Cont.)	Treatment sludges, recycling or energy recovery by-products	33.3%	42.9%	31.6%
	Other[a]	0.0%	0.0%	21.1%
	TOTAL Reporting Release from at Least One Source[b]:	**77.8%**	**85.7%**	**100.0%**
On-Site Energy Recovery[c]	**TOTAL Reporting Releases from at Least One Source:**	**0.0%**	**14.3%**	**10.5%**
On-Site Treatment[c]	**TOTAL Reporting Releases from at Least One Source:**	**54.2%**	**71.4%**	**36.8%**
On-Site Recycle[c]	**TOTAL Reporting Releases from at Least One Source:**	**12.5%**	**7.1%**	**0.0%**

[a]Sources listed as "other" include: dust releases from air pollution control devices (baghouses, electrostatic precipitators, and rotoclones), off-spec product, and remedial actions.
[b]Total is not additive. Facilities may report a release type from multiple sources.
[c] Data not available for distribution from individual sources.



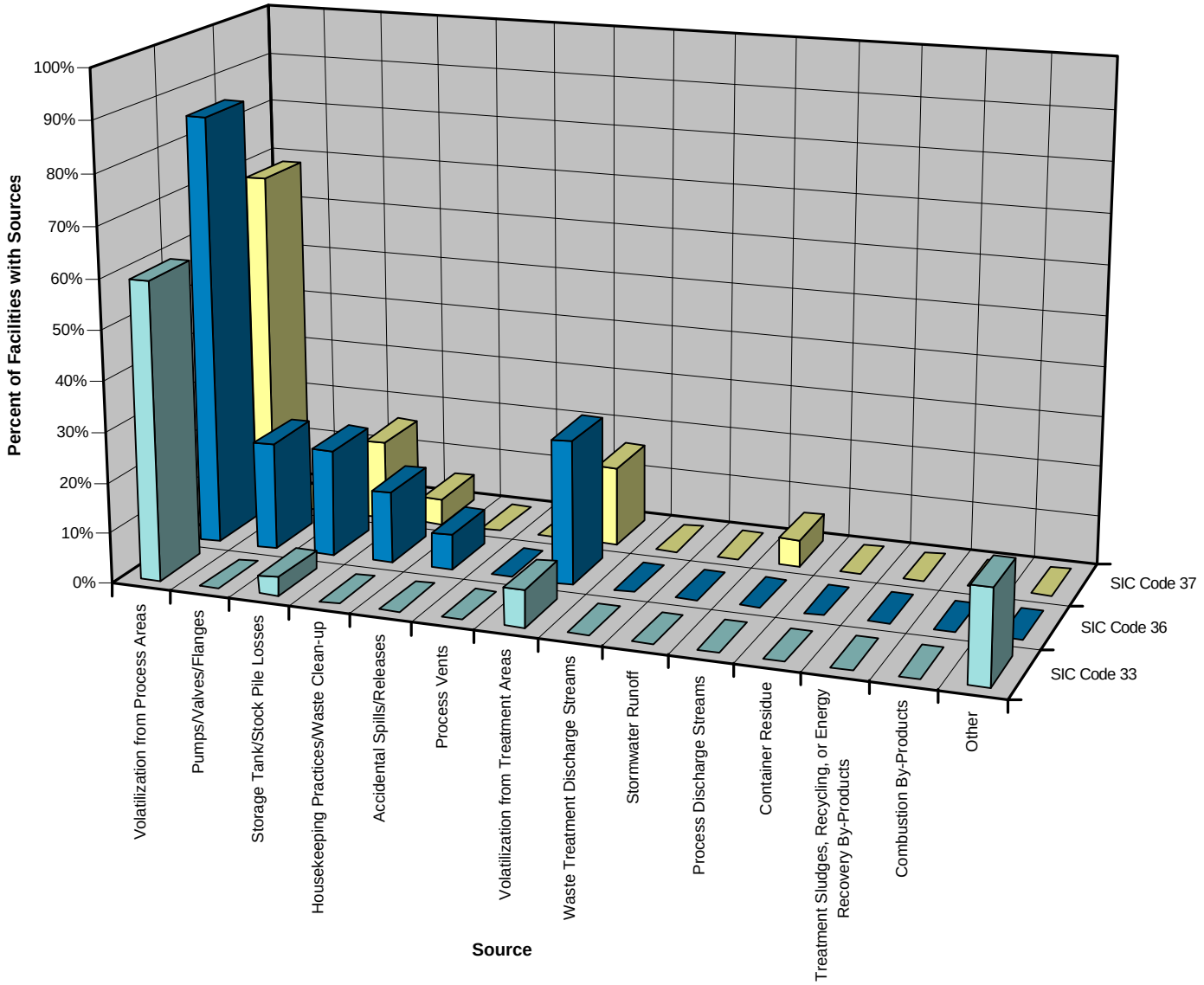
Data for this figure can be found on Table 5-1.

Figure 5-1a. Distribution of Release and Other Waste Management Activity Types (RY 1996)



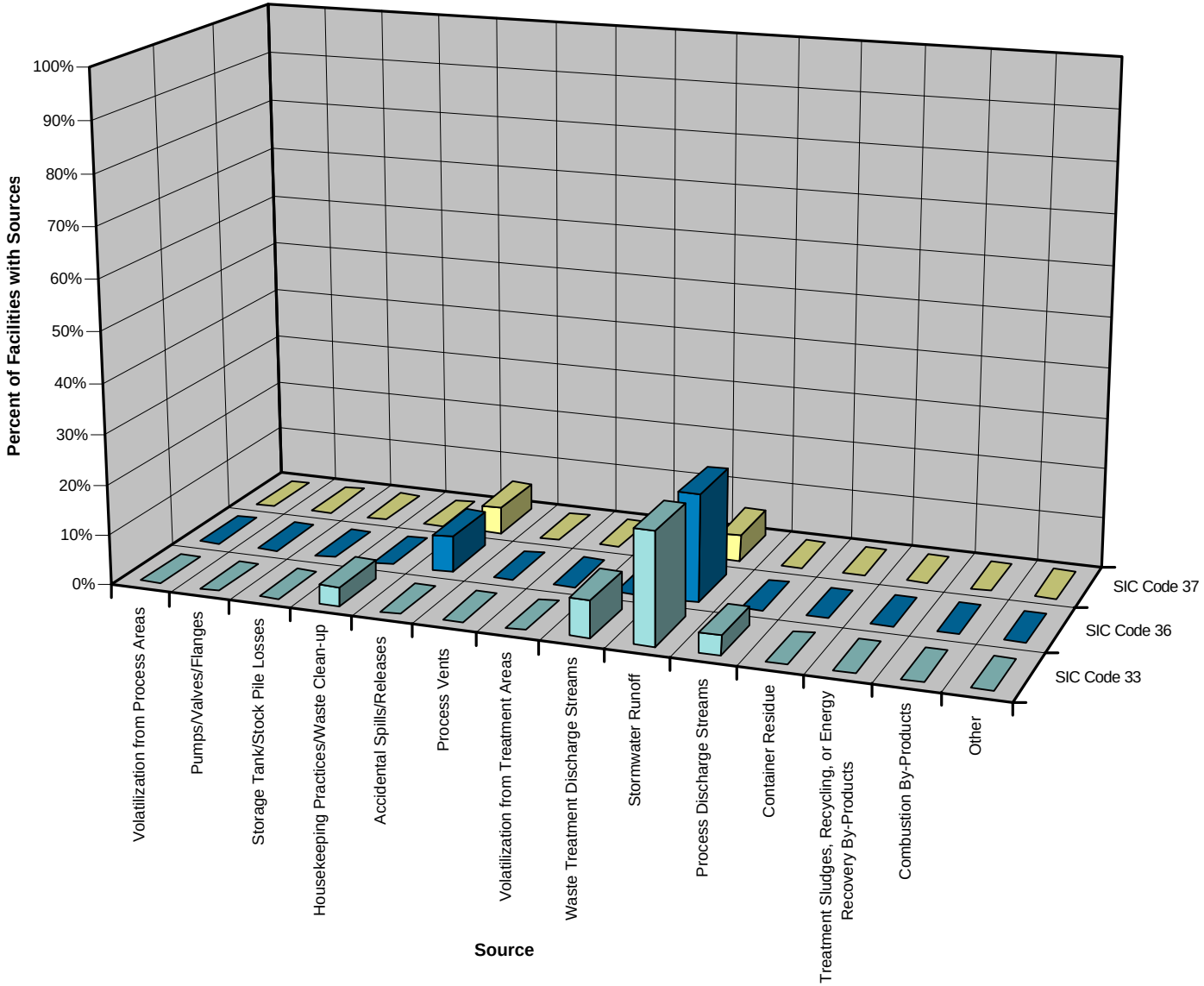
Data for this figure can be found on Table 5-1.

Figure 5-1b. Distribution of Sources for Fugitive Releases



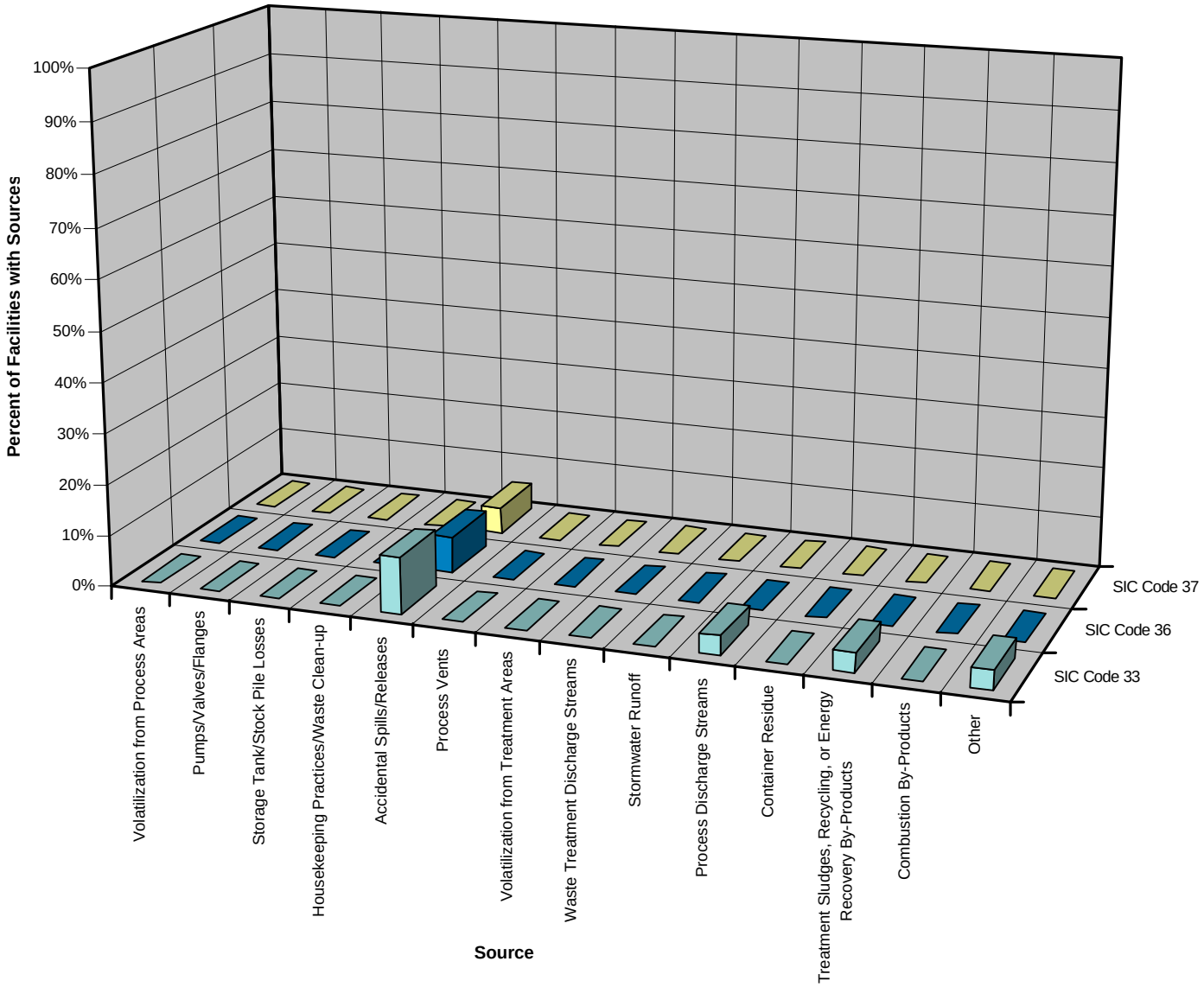
Data for this figure can be found on Table 5-1.

Figure 5-1c. Distribution of Sources for Stack Releases (RY 1996)



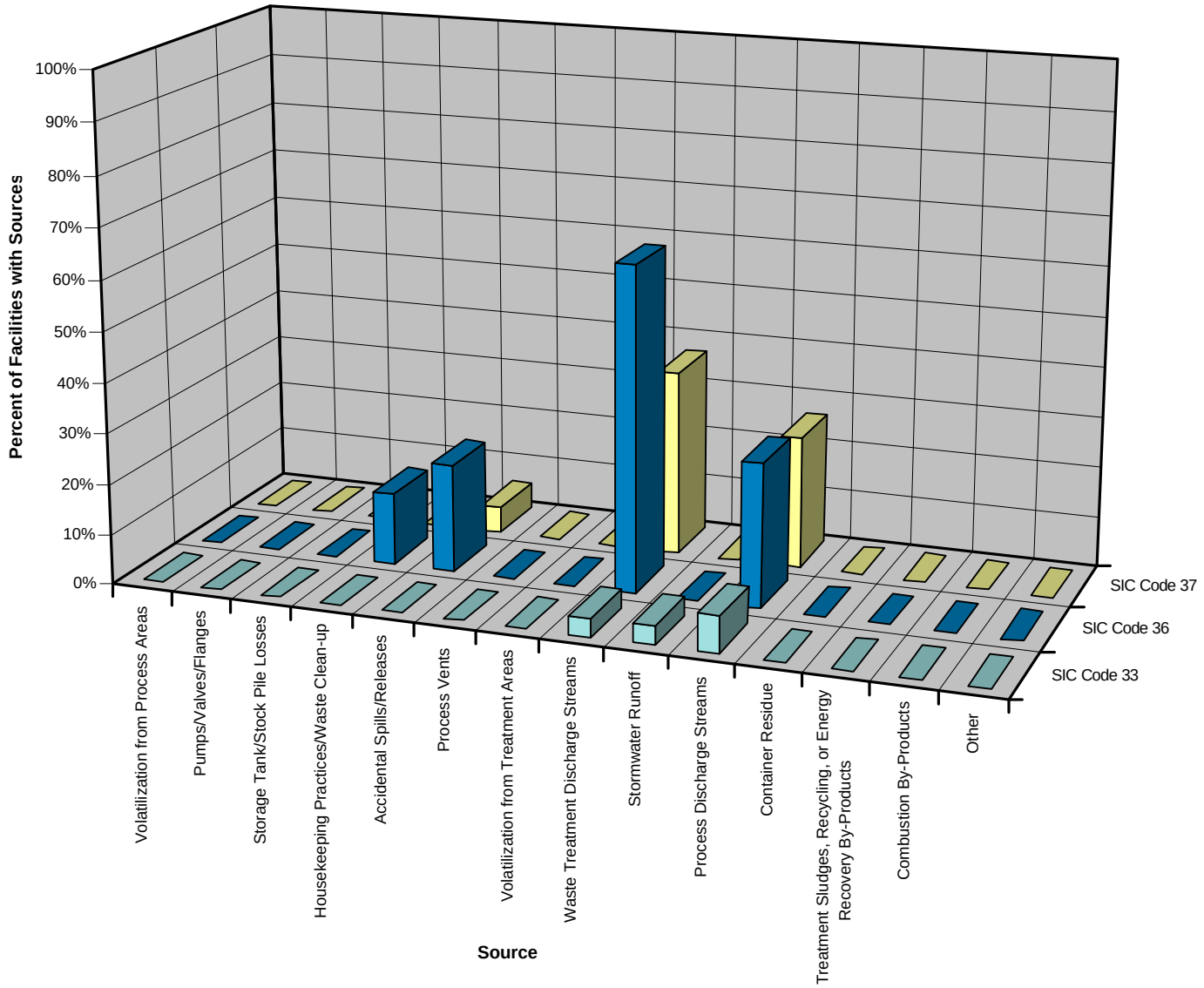
Data for this figure can be found on Table 5-1.

Figure 5-1d. Distribution of Sources for Surface Water Discharges (RY 1996)



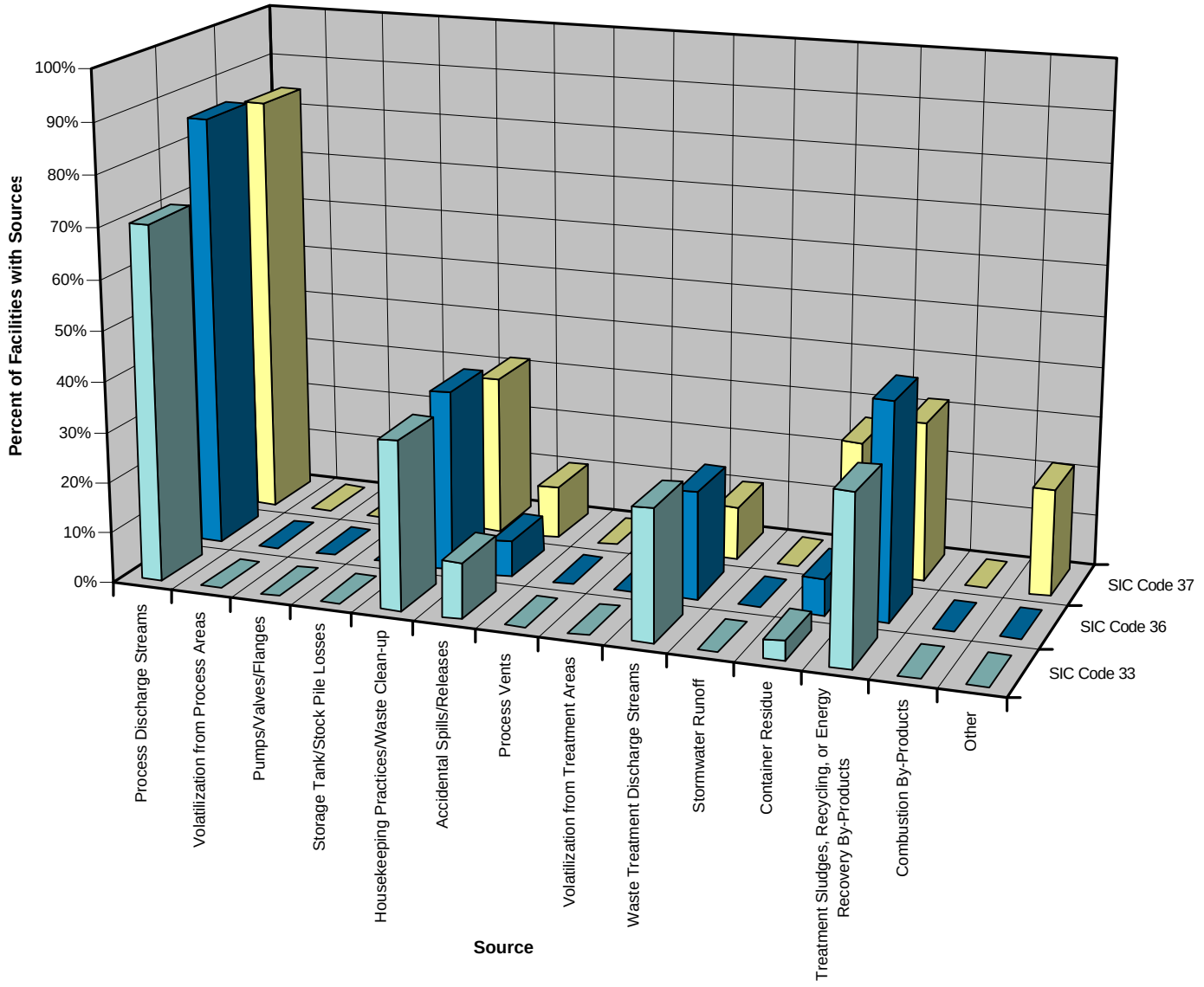
Data for this figure can be found on Table 5-1.

Figure 5-1e. Distribution of Sources for Land On-Site (RY 1996)



Data for this figure can be found on Table 5-1.

Figure 5-1f. Distribution of Sources for Discharges to POTWs (RY 1996)



Data for this figure can be found on Table 5-1.

Figure 5-1g. Distribution of Sources from Off-Site Transfers for Release and Other Waste Management Activities

36, and 37 than in the previously studied SIC Codes. A similar trend is seen when comparing stack air releases.

Site surveyors observed at least one type of off-site transfer for release and other waste management activities at nearly all facilities (78%, 86%, and 100% in SIC Codes 33, 36, and 37, respectively). In RYs 1994 and 1995, site surveyors observed a significantly smaller percent of facilities with off-site transfers for release and other waste management activities (90% in SIC Code 25 and 55% to 70% for all other SIC Codes). The number of off-site transfers for release and other waste management activities increased for the RY 1996 study, because facilities in SIC Codes 33, 36, and 37 generally collect a large quantity of "scrap" or "unusable" material containing metals and send it off site for waste management activities.

Many facilities also discharged EPCRA Section 313 chemicals to water, both indirectly discharged to a POTW and directly discharged to surface water. The percent of discharges to water is slightly higher than that observed during site visits to facilities in RY 1994 and RY 1995. Underground injection was never observed during site visits to facilities, in contrast to what was seen in RY 1994 and RY 1995.

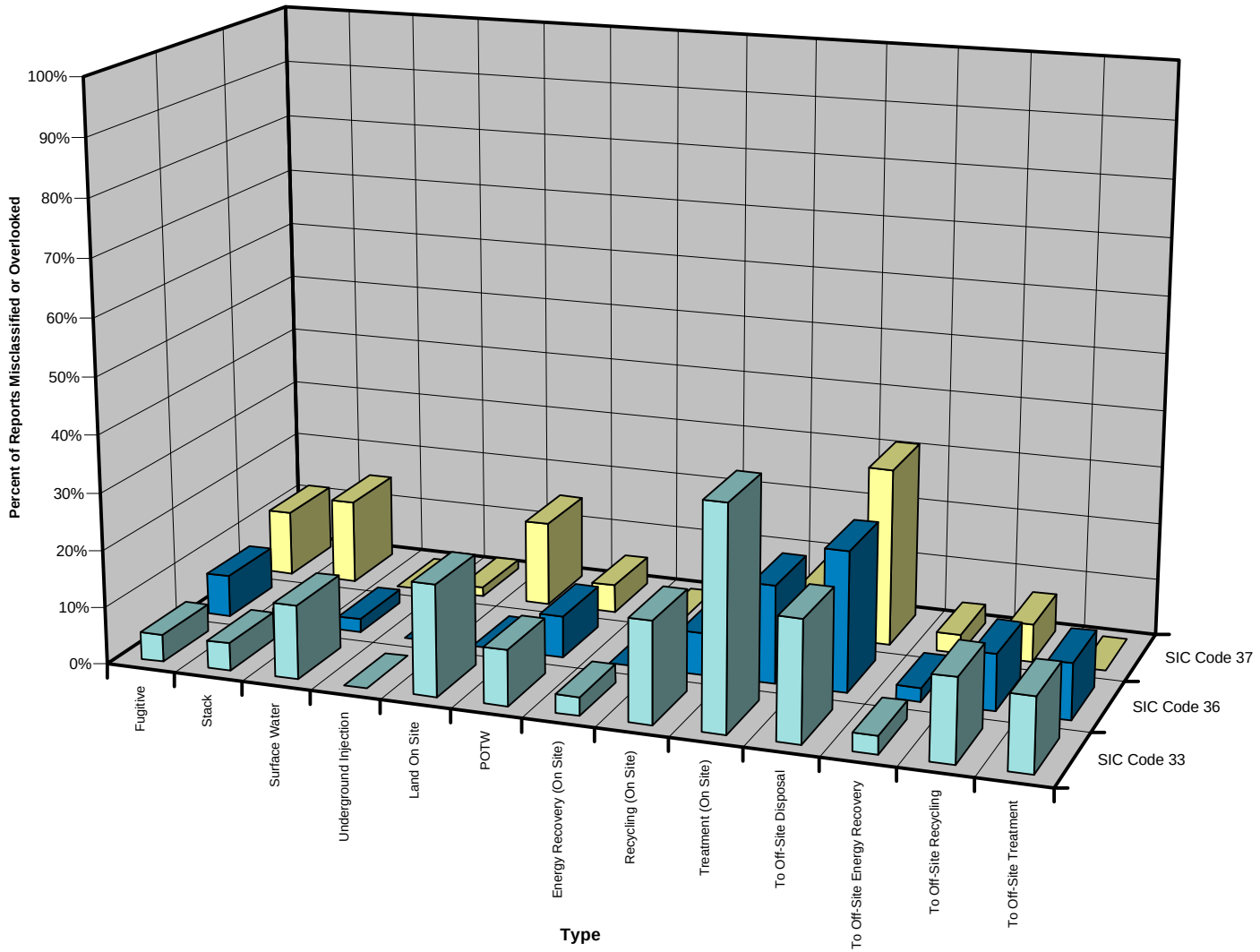
5.2 Incorrectly Reported Release and Other Waste Management Activity Types

This section presents the release and other waste management activity types that facilities misclassified and overlooked. An analysis of these results can help identify the sections of the RY 1996 Form R that cause confusion for the regulated community. A comparison with site surveys conducted in individual SIC Codes can help identify areas of confusion that are specific to various industries. These data alone cannot be used to quantitatively assess the accuracy of data in the TRI database because the magnitude of errors in estimates is not considered. Section 6 presents a detailed quantitative analysis. Table 5-2 and Figure 5-2 presents the percent of misclassified or overlooked release and other waste management activities.

Table 5-2

Misclassified and Overlooked Types of Release and Other Waste Management Activities

Release or Other Waste Management Activity Type	Percent of Reports Misclassified or Overlooked		
	SIC Code 33	SIC Code 36	SIC Code 37
Fugitive	4.8%	7.3%	11.5%
Stack	4.8%	2.4%	14.8%
Receiving Stream	12.9%	2.4%	0.0%
Underground Injection	0.0%	0.0%	1.6%
Land On Site	19.4%	0.0%	14.8%
POTW	9.7%	7.3%	4.9%
Energy Recovery (On Site)	3.2%	0.0%	0.0%
Recycling (On Site)	17.7%	7.3%	0.0%
Treatment (On Site)	38.7%	17.1%	8.2%
To Off-Site Disposal	21.0%	24.4%	31.1%
To Off-Site Energy Recovery	3.2%	2.4%	3.3%
To Off-Site Recycle	14.5%	9.8%	6.6%
To Off-Site Treatment	12.9%	9.8%	0.0%



Data for this figure can be found in Table 5-2.

Figure 5-2. Misclassified or Overlooked Types of Release and Other Waste Management Activities

A comparison of the release and other waste management activities reported by facilities with those identified by site surveyors showed that a large number of facilities reported the wrong release or other waste management activity type. This section discusses those types that were incorrectly reported and presents a qualitative discussion regarding the corresponding error.

5.2.1 Air Releases

A small number of facilities misclassified air emissions or overlooked them entirely. Although facilities often had difficulty in quantifying their releases, most recognized they existed and made attempts to calculate release estimates from most sources. The facilities' most common source of error was their failure to identify fugitive emissions of metals or metal compounds when processes were conducted at extremely high temperatures. Facilities also commonly failed to report EPCRA Section 313 chemicals in particulate matter that escaped from baghouses or other dust collection systems. The number of facilities in SIC Codes 33, 36, and 37 that misclassified or overlooked air emissions is lower than that observed in RYs 1994 and 1995. A primary reason is that many facilities visited in RYs 1994 and 1995 misclassified releases to general room air. Facilities in SIC Codes 33, 36, and 37 were likely to have process air releases to large, open areas rather than in an enclosed room. Therefore, the potential for this mistake did not occur. Another common error in RYs 1994 and 1995 was overlooking stack releases from storage tanks. However, this error was not detected in facilities in SIC Codes 33, 36, and 37 as these facilities were less likely to have storage tanks.

5.2.2 Off-Site Transfers for Recycling and Disposal, and On-Site Recycling

Many facilities in RY 1996 misclassified or overlooked off-site transfers for release and other waste management activities. In particular, transfers off-site for disposal and off-site transfers for recycling were often misreported, in addition to on-site recycling.

A primary reason for misclassified release and other waste management activities is confusion over "direct reuse" (which is not reportable) and "recycling" (which is reportable). For example, facilities often reported large quantities of off-specification products containing metals that were directly reused in secondary smelting operations (without further waste

management) as sent off-site for recycling. Other facilities reported scrap, slag, and dust even though it was directly reused in the production of asphalt as either off-site or on-site recycling. Similarly, facilities misclassified on-site recycling when various process streams were directly reused.

A frequently observed error for transfers off-site for disposal was overlooking large quantities of EPCRA Section 313 chemicals (typically metals) that were present in dust collected in baghouses, electrostatic precipitators, and rotoclones. This dust is often disposed to landfills. Finally, some facilities reported transfers off-site for recycling without knowledge of how the waste was actually handled. In these instances, most facility contacts could not provide a basis for claiming recycling and indicated that the material may actually be disposed.

Many of these facilities recognized that they may have been misreporting and expressed a desire for clarification on the reuse/recycling issue in general and its applicability, specifically to typical operations in SIC Codes 33, 36, 37. A comparison to previous data shows that many facilities in RYs 1994 and 1995 also frequently misclassified off-site transfers for release and other waste management activities. However, those facilities did not typically have "recycling" vs. "direct reuse" concerns.

5.2.3 On-Site Treatment and Land Disposal

On-site treatment and on-site land disposal were overlooked at a large number of facilities (not misclassified), in particular in the primary metals industry (SIC Code 33). Most facilities failed to consider the removal of dust from an air stream as "treatment or removal" when it applies to metals and metal compounds. Some facilities felt that because the metal was not destroyed, it should not be reported in Section 7A as being treated. *[The 1996 TRI instructions say that the waste treatment efficiency reported must represent physical removal of the parent metal from the waste stream, p.41]* Other facilities entirely overlooked the dust being treated and its subsequent disposal to land. This situation was observed more frequently in facilities that employed large dust collection systems and when metals were present in the process.

5.2.4 Water Discharges

Discharges containing EPCRA Section 313 chemicals from facilities in SIC Codes 33, 36, and 37 to POTWs and receiving streams were less prevalent than observed at site visits for RYs 1994 and 1995. However, there were some instances where discharges were overlooked.

5.3 Overlooked Release and Other Waste Management Activities

Section 5.2 discussed the release and other waste management activity types that were either misclassified or overlooked. This section identifies the process or unit operation sources that were overlooked. An analysis of this information may be used to identify specific unit operations or processes that are problematic for EPCRA Section 313 reporting. Additional guidance and a focussed effort to analyze the fate of EPCRA Section 313 chemicals from these sources will increase the accuracy of data in the TRI database. Again, these data do not reflect a quantitative measurement of the estimates associated with release and other waste management activities, but a quantitative analysis of the estimates is presented in Section 6.

In general, fewer facilities in SIC Codes 33, 36, and 37 completely overlooked release and other waste management activity sources compared to those visited in RYs 1994 and 1995 (although the magnitude of the associated errors may be greater).

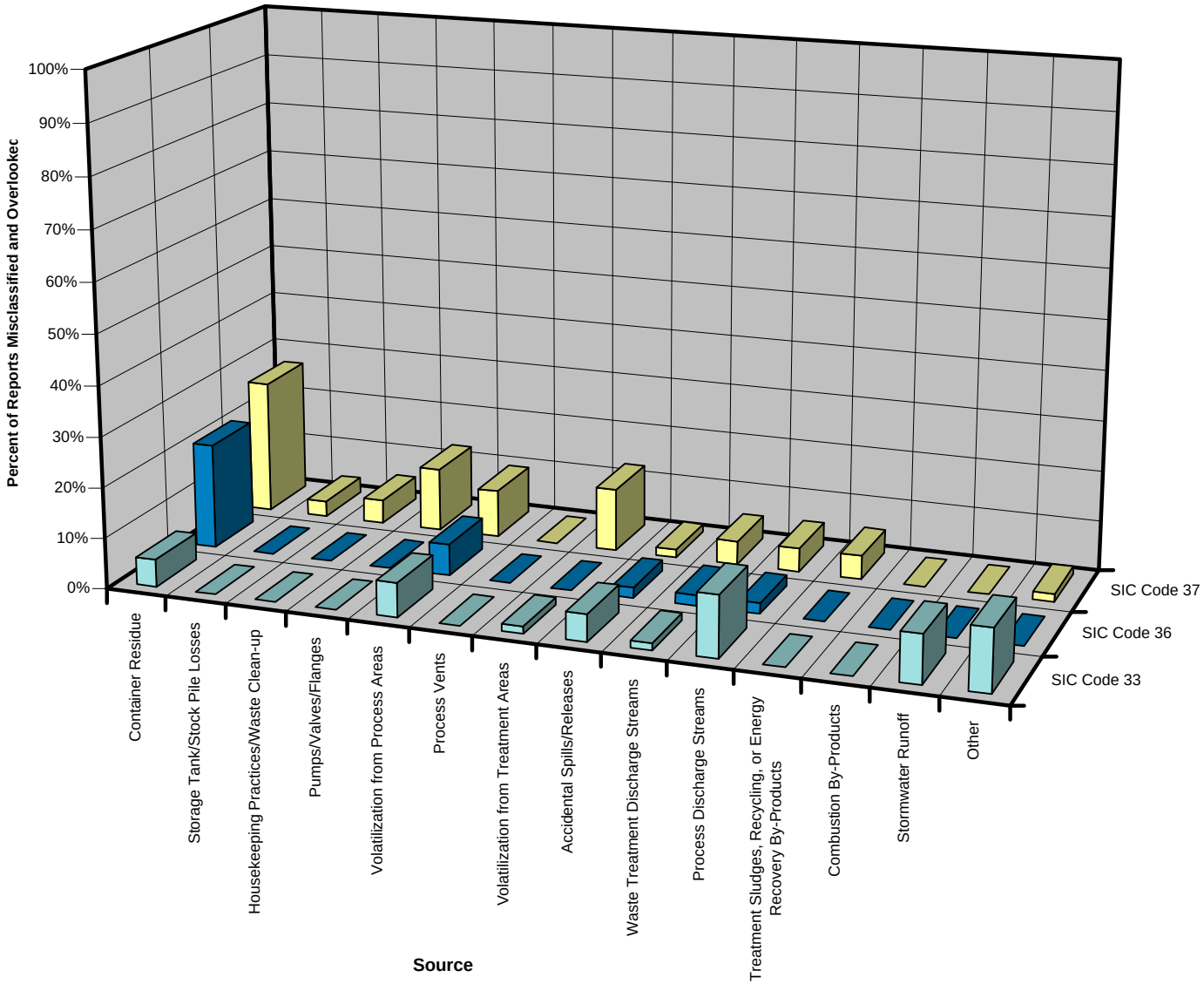
As shown on Table 5-3 and Figure 5-3, several facilities overlooked some sources of release and other waste management activities entirely. In some cases, the result was an underestimation of the overall quantity of the toxic chemical managed as waste by the facility. However, in cases where a mass balance was used as the method to determine the quantity of the toxic chemical managed as waste, the facility may have included the quantity that was overlooked in another source. For example, a facility may have overlooked a 1% stack air release from a dust collection system that is 99% efficient. However, after conducting a material balance and analyzing the total throughput, the facility may have assumed this quantity was released from process areas as fugitive emissions. In this case, the stack release to air would have been under reported, while the fugitive air emissions would have been over reported.

Table 5-3

Misclassified and Overlooked Sources of Release and Other Waste Management Activities

Source	Percent of Reports Identified (weighted)		
	SIC Code 33	SIC Code 36	SIC Code 37
Container residue	5.4%	20.8%	26.6%
Storage tank/stock pile losses	0.0%	0.0%	3.1%
Housekeeping practices/waste cleanup	0.0%	0.0%	4.7%
Pumps/valves/flanges	0.0%	0.0%	12.5%
Volatilization from process areas	6.8%	6.3%	9.4%
Process vents	0.0%	0.0%	0.0%
Volatilization from treatment areas	1.4%	0.0%	12.5%
Accidental spills/releases	5.4%	2.1%	1.6%
Waste treatment discharge streams	1.4%	2.1%	4.7%
Process discharge streams	12.2%	2.1%	4.7%
Treatment sludges, recycling or energy recovery by-products	0.0%	0.0%	4.7%
Combustion by-products	0.0%	0.0%	0.0%
Stormwater runoff	9.5%	0.0%	0.0%
Other[a]	12.2%	0.0%	1.6%

[a]Sources of "other" include: baghouse dust, over spray, remedial actions, and repackaging losses.



Data for this figure can be found in Table 5-3.

Figure 5-3. Misclassified and Overlooked Sources of Release and Other Waste Management Activities

This error was observed on a site-specific basis, typically when a mass balance was used for facility-wide estimates. Many facilities overlooked sources entirely and did not account for the associated EPCRA Section 313 chemicals when reporting for any types of release and other waste management activities on the Form R. The sources most often overlooked were container residue (typically as liquid residue in "empty" drums), stack emissions of particulate matter, transfers and disposal of collected particulate matter, and transfers or management of off-specification product.

5.3.1 Container Residue

In RY 1996, the largest source of overlooked release and other waste management activities (considering frequency, not overall quantity) was from container residue, as was the case in RYs 1994 and 1995; however, both the frequency and magnitude were considerably less in SIC Codes 33, 36, and 37. A main reason for the decrease in errors is that fewer facilities in these SIC Codes purchase or use drums of organic liquids, which decreases the opportunity to overlook container residue. Although the EPCRA Section 313 instructions specify that container residue should be considered as a release or other waste management quantity, facilities assumed that all used drums, totes, or small containers were completely empty and the subsequent transfer of the empty containers off site for disposal (disposal on site was rarely observed in SIC Codes 33, 36, and 37) did not result in any release or other waste management activities of EPCRA Section 313 chemicals. Many facilities did not consider the potential for reportable quantities of residual chemicals in these containers. Other facilities considered this potential release or other waste management quantity but felt it was negligible (and did not report it) if drums were shipped as "empty", as defined by federal and/or state shipping regulations.

In practice, liquids are often removed from drums by gravity draining or by pumping. Neither of these methods removes all material from the drum and an appreciable quantity may remain. Hazardous Materials Transportation Act (HMTA), Hazardous Materials Transportation Uniform Safety Act (HMTUSA), and Resource Conservation Recovery Act (RCRA) regulations require special handling precautions when transporting drums containing hazardous materials (drums are often defined as "RCRA empty" for shipping purposes if they contain less than one inch of a liquid substance). Therefore, facilities often remove the materials in the containers to levels which are below state or federal regulations, but they do not completely empty them. It

should be noted that some facilities (less than was observed in RYs 1994 and 1995) sent hundreds of "empty" drums off-site that potentially contained some residual EPCRA Section 313 chemical. This transfer results in a significant quantity released or otherwise managed as waste that was overlooked.

Some facilities also overlooked release and other waste management quantities due to residual powdered EPCRA Section 313 chemicals in empty bags. This quantity was significantly less than observed in previous reporting years, primarily because pigments in the form of solids are commonly used in painting operations (SIC Code 285, RY94), while polymer beads were the only solid material that result in container residue observed at more than one site in SIC Codes 33, 36, and 37. Note that most facilities that add powdered metal alloys to molten processes do so by dumping the alloy, including its container, to the kettle. Therefore, in this instance there is no container residue.

Most of the liquid release and other waste management quantities from overlooked container residue should have been reported as off-site transfers for disposal. However, some should have been reported to off-site recycling, off-site treatment, or off-site energy recovery. Other overlooked liquid discharges should have been reported as discharged to either POTWs or to surface water streams because the drums were rinsed on site and the rinsewater was collected and sent to the local POTW or receiving stream. Most overlooked solid releases from bag residue should have been reported as being disposed to on-site landfills or to off-site disposal.

5.3.2 Process Areas and Discharge Streams

The next most overlooked sources were volatilization from process areas and process discharge streams. Many facilities in the primary metals industry (SIC Code 33) overlooked significant quantities of metals that volatilize during smelting and foundry operations. Metals and metal compounds often volatilize or become entrained as fumes or dust during these operations. The concentration of these metals in the air stream is often small (in the parts per million range); however, the throughput is so high that a significant quantity may be overlooked. Facilities often failed to apply metals with the "fume or dust" qualifier to the manufacturing threshold. Similar oversights were observed, although less frequently, in SIC Codes 36 and 37.

Overlooking EPCRA Section 313 chemicals in air streams also resulted in underestimating or overlooking the quantity from other sources, such as dust that is ultimately released or disposed in stormwater, other process discharge streams, and waste treatment discharge streams.

5.3.3 Other Treatment Areas

Facilities rarely overlooked volatilization from treatment areas, most likely because most treatment chemicals are either non-volatile or are completely destroyed during the treatment process. This observation is consistent with RYs 1994 and 1995 surveys. Similarly, release and other waste management quantities from storage tank losses; releases from process vents, pumps, valves, and flanges; and housekeeping wastes were rarely overlooked.

5.3.4 Combustion

Site surveyors did not identify any overlooked release or other waste management activities from combustion by-products at facilities in SIC Codes 33, 36, or 37. In contrast to the facilities visited for RYs 1994 and 1995 survey programs, very few of the facilities visited for the RY 1996 survey used on-site boilers, industrial furnaces, or incinerators.

5.4 Calculation Methodologies

EPA requires facilities to designate one of four calculation methodology categories used for each release or other waste management activity estimate (monitoring data, mass balances, emission factors, and engineering judgment or calculations). Table 5-4 presents the distribution of calculation methodologies that were used to determine estimates for each release or other waste management activity type. An analysis of the methodologies used and how frequently facilities used the best available methodology provides insight on the accuracy of some estimates and on the reason for some errors.

It was observed during the review of facility notes that facilities often used multiple methods or reported a method that was inconsistent with the method actually used. Therefore, the data reported in Table 5-4 represents the site surveyor's opinion as to the primary method

actually used by the facility, not necessarily the method reported on the facility's Form R (and entered in the TRI database). Using the surveyor's opinion allows for a better analysis of data accuracy when compared to the actual methods used. Additionally, a significant number of facilities used hazardous waste manifests to calculate estimates of off-site transfers. Site surveyors noted these occurrences, when applicable. Their frequency of use is presented along with the four EPA-accepted methods. It should be noted that few or no release or other waste management activity quantities were reported for several release or other waste management activity types. In these circumstances the table shows zero percent.

5.4.1 Air Releases

For RY 1996, nearly all facilities reported at least one fugitive release. As in RYs 1994 and 1995, site surveyors observed that fugitive releases were typically the most difficult for facilities to estimate. Engineering calculations were the predominant method used by most facilities. Site surveyors observed that many facilities actually used one or more of the methods to estimate fugitive emissions, and then applied engineering judgment to total the emissions from all sources. They used engineering judgment for partitioning releases between stack and fugitive if monitoring data were not available. Mass balances, monitoring data, and emission factors are presented in Table 5-4 only when they were the predominant method used.

It was uncommon for facilities to have access to monitoring data for fugitive releases. However, facilities did use it when available (typically in the form of periodic leak tests). Only a few facilities used emission factors, a contrast to survey results from RYs 1994 and 1995 when several facilities used emission factors. Many facility contacts inquired whether emission factors that were relevant to their processes existed (for fugitive or stack emissions). They were not aware of EPA-published factors or any relevant trade association factors and very few had conducted testing to develop facility-specific emission factors. The type of emission factors used and a subsequent discussion is presented below.

Table 5-4

Distribution of Calculation Methodologies

Release or Other Waste Management Activity Type	Calculation Methodology	Percent of Facilities using Methodology		
		SIC Code 33	SIC Code 36	SIC Code 37
Fugitive	Engineering calculations	83.3%	90.5%	60%
	Mass balance	0.0%	4.8%	31.4%
	Monitoring data	11.1%	0.0%	5.7%
	Emission factors	5.6%	4.8%	2.9%
Stack	Engineering calculations	60.5%	69.9%	42.9%
	Mass balance	7.9%	24.2%	48.6%
	Monitoring data	26.3%	3.0%	5.7%
	Emission factors	5.3%	3.0%	2.9%
Receiving Stream	Engineering calculations	16.7%	12.5%	0.0%
	Mass balance	0.0%	12.5%	0.0%
	Monitoring data	83.3%	75.0%	100.0%
Underground Injection	Underground injection was not claimed or observed	0.0%	0.0%	0.0%
On-Site Land Disposal	Engineering calculations	0.0%	100.0%	100.0%
	Monitoring data	100.0%	0.0%	0.0%
POTW	Engineering calculations	50.0%	28.0%	45.5%
	Mass balance	0.0%	16.0%	4.5%
	Monitoring data	50.0%	56.0%	50.0%
To Off-Site Disposal	Engineering calculations	34.6%	16.7%	28.5%
	Monitoring data	61.5%	83.3%	64.3%
	Hazardous waste manifests	3.8%	0.0%	7.1%

Table 5-4 (Continued)

Release or Other Waste Management Activity Type	Calculation Methodology	Percent of Facilities using Methodology		
		SIC Code 33	SIC Code 36	SIC Code 37
To Off-Site Treatment	Mass balance	25.0%	25.0%	0.0%
	Monitoring data	75.0%	75.0%	100.0%
To Off-Site Recycle	Engineering calculations	17.4%	28.6%	63.0%
	Mass balance	0.0%	14.3%	10.5%
	Monitoring data	82.6%	42.9%	26.3%
	Hazardous waste manifests	0.0%	14.3%	0.0%
To Off-Site Energy Recovery	Engineering calculations	100.0%	0.0%	55.1%
	Mass balance	0.0%	9.1%	0.0%
	Monitoring data	0.0%	63.6%	27.6%
	Hazardous waste manifests	0.0%	27.3%	17.2%
On-Site Treatment	Engineering calculations	100.0%	47.1%	92.3%
	Mass balance	0.0%	47.1%	7.7%
	Monitoring data	0.0%	5.9%	0.0%
On-Site Energy Recovery	Mass balance	0.0%	100.0%	0.0%
On-Site Recycling	Engineering calculations	50.0%	50.0%	100.0%
	Monitoring data	50.0%	50.0%	0.0%

[1]"Other" methodologies according to facility notes include: off-site facility test reports, facility or trade association computer modeling, air permit limits, and "undocumented".

Due to a lack of monitoring data and relevant emission factors, facilities used mass balances to determine fugitive releases from at least one process line or unit operation when a material balance around the entire facility resulted in a chemical quantity that was unaccounted for.

Most facilities also reported a stack release. Although facilities had difficulty in estimating these releases, they typically indicated less difficulty in identifying and quantifying these releases than observed with fugitives. Engineering calculations and mass balances were the most often used methods. However, surveyors also observed the use of emission factors and monitoring data (actual releases from stack tests). As with fugitive emissions, few facilities were aware of published emission factors that applied to their processes. However, some had conducted stack testing and used the appropriate monitoring data to develop site-specific factors accordingly.

5.4.2 Water Discharges

Many facilities reported discharges to POTWs and/or surface water. Using monitoring data was the primary method to calculate POTW and surface water discharges. Typically, discharges were monitored for compliance with various local, state, or other federal regulations, resulting in an accurate estimate. If monitoring data were not available, facilities typically used a mass balance around processes involving contact water to determine the quantity of EPCRA Section 313 chemical that could not be accounted for. Then, engineering judgment (usually based on knowledge of chemical volatility and solubility) was used to estimate a partition factor between releases of the unaccounted quantity that would be lost to fugitive air versus the quantity discharged to water.

5.4.3 Off-Site Transfers for Release and Other Waste Management Activities

Table 5-4 shows that most facilities used monitoring data and/or hazardous waste manifests to estimate off-site transfers for release or other waste management. Monitoring data came from two main sources: (1) periodic facility sampling of the process waste streams that were collected prior to shipment, and (2) sampling conducted by the receiving facility. Documentation for this data was typically more prevalent and more complete than methods used to estimate

release and other waste management activities to most other sources. However, in contrast to data observed in RYs 1994 and 1995, test data often provided only the concentration of EPCRA Section 313 chemicals. Facilities often made mistakes in calculating the throughput of material sent off site. Also, many sources were overlooked and some transfers were reported when they were actually directly reused (and not reportable). Therefore, the accuracy of the overall off-site transfer estimates is questionable.

5.4.4 Correct Methodology Usage

Figure 5-5 presents the frequency with which the site surveyors felt the method used by the facility would result in the most accurate estimate, based on information and data available to the surveyor at the time of the site visit. It does not present the frequency that the facilities correctly calculated the quantity of release or other waste management activity. This figure shows concurrence with the selected method in most cases.

As observed during surveys from RYs 1994 and 1995, it should be noted that during many visits the surveyor identified another, more accurate method that could have been used to estimate release and other waste management quantities, if a particular variable had been tracked for RY 1996. In many cases, the facility contact indicated that it would have been fairly easy for the facility to implement the suggestion and that they planned to take the surveyors' advice for subsequent years. However, it was not always possible to recreate the required variable. Another limitation to this analysis is the fact that surveyors often identified a more accurate method that could be used based on data the facility claimed to have, but the facilities were unable to gather the information immediately for use by the site surveyor.

Table 5-5

Frequency the Best Methodology was Used by Facilities to Estimate Release and Otherwise Waste Managed Quantities

SIC Code	Frequency
33	85.9%
36	99.3%
37	87.7%

5.4.5 Emission Factors

Chemical-specific emission factors were sometimes used to estimate fugitive and stack releases. EPA instructed site surveyors to determine the type of chemical-specific emission factors used, when applicable. The potential types were designated as facility-derived, EPA-approved or published, trade association-derived, and other. Table 5-6 presents the percentage of use for each type of chemical-specific emission factor.

These factors were typically employed to estimate fugitive releases of volatile chemicals from process areas or piping (leaks from pumps, valves, flanges, etc.) or to estimate stack releases from storage tanks and stack releases from gasses generated by unit operations that were channeled through air pollution control devices (typically baghouses). Non-chemical-specific factors in trade association guidance or derived by the facility were treated as engineering calculations.

Table 5-6

Types of Emission Factors Used for Fugitive and Stack Air Releases

Release Type	Release Source	Percent (by report)		
		SIC Code 33	SIC Code 36	SIC Code 37
Fugitive	Facility derived	83.3%	100.0%	25.0%
	EPA derived	0.0%	0.0%	25.0%
	Trade Association derived	16.7%	0.0%	25.0%
	Other	0.0%	0.0%	25.0%
Stack	Facility derived	100.0%	100.0%	75.0%
	EPA derived	0.0%	0.0%	0.0%
	Trade association derived	0.0%	0.0%	25.0%
	Other	0.0%	0.0%	0.0%

5.5 On-Site Recycling, Treatment, and Energy Recovery

With the exception of gases routed through dust collection systems, the RY 1996 survey finds that EPCRA Section 313 chemicals were rarely managed on site (recycling, treatment, or energy recovery). Table 5-2 and Figure 5-2 show that some facilities incorrectly identified these waste management activities. Additionally, EPA recognized the potential confusion in reporting requirements for on-site treatment in Section 7A and Section 8.6 of the EPCRA Section 313 report. Therefore, site surveyors specifically determined whether the quantities reported were sent to treatment versus actually treated. Facilities typically correctly identified on-site treatment activities when they existed (with the exception of significant confusion regarding whether to report dust collection systems, particularly for metals entrained in the dust). Only a few facilities incorrectly reported, as shown in Table 5-7.

Table 5-7

Facilities Incorrectly Reporting the Quantity Sent to Treatment Rather than Actually Treated

SIC Code	Percent Incorrectly Reported
33	7.4%
36	14.3%
37	5.3%

It should be noted that the quantitative values presented in Figure 5-2 and Table 5-2 regarding on and off-site recycling may not be accurate because most facilities were confused by the definition of "recycling". EPA recognized that this potential might exist and instructed site surveyors only to analyze release and other waste management activities to recycling activities if the facility reported them. Therefore, site surveyors only recorded on-site recycling as incorrect if such activities were claimed but did not exist.

Site surveyors discussed on-site management issues and acquired feedback from facility contacts. The primary concern raised was that definitions of the terms "recycling", "direct reuse", and "waste management" are generally unclear. Additionally, facilities felt that these terms were particularly confusing when applied to large quantities of off-specification material that was "recycled", either on site or off site. Tens of thousands of pounds of metals could be involved in these processes.

Facilities also expressed confusion about how to report on-site treatment of metals or metal compounds. Many realized that metals cannot be treated for destruction; however, they can be removed from a process waste stream. Facilities questioned whether this removal should be considered "treatment" in Section 7A, and whether the removal efficiency (opposed to the destruction efficiency) should be reported. *[Facilities should report the removal efficiency of metals in the waste stream.]*

Very few facilities were confused or concerned regarding when to report EPCRA Sections 313 chemicals sent to treatment versus those chemicals sent to energy recovery, perhaps because relatively few EPCRA Section 313 chemicals in these SIC Codes were incinerated.

On-site recycling was rarely claimed at these facilities. Typically recycle streams included off-specification product, process solvents, or waste dust collected in a baghouse. Tables 5-8 and 5-9 summarize data that were collected for on-site recycling that was observed during site visits. Table 5-9 presents the frequency that each EPCRA Section 313 chemical or chemical category was recycled, as reported by these facilities.

Table 5-8

Observed On-Site Recycling Activities

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream	SIC Code
1	Other	By-product	33
2	Other	Polymer remelt or "reshred"	33
1	Metals Recovery, Electrolytic, and Ion Exchange	Spent metal plating bath	36
1	Other (Process Discharge Stream)	Product grinding-back to process stream	37
1	Spent Process Solvent	Solvents/organics recovery batch still	37

Table 5-9

Chemicals For Which On-Site Recycling Was Claimed (SIC Codes 33, 36, and 37 Combined)

EPCRA Section 313 Chemical or Chemical Category	Number of Facilities Reporting
Copper or copper compounds	2
Lead compounds	2
Antimony compounds	1
Hydrogen fluoride	1
Methyl ethyl ketone)	1
Phenol	1
Toluene	1
Xylene (mixed isomers)	1

6.0 RELEASE AND OTHER WASTE MANAGEMENT ACTIVITIES

Release and other waste management estimates are the most highly scrutinized and publicized data in the TRI program. Thus, comparing the facility estimates to the surveyor estimates gives an indication of how accurately the facilities in the three SIC Codes have reported. This section discusses release and other waste management estimates made by facilities and site surveyors. Major differences in release and other waste management estimates between the facilities and site surveyors are noted, and the reasons for the differences are explained. The following topics are discussed in each subsection:

- On-site release and other waste management estimates, as reported in Section 5 of the Form R (Section 6.1)
- Off-site transfers for release and other waste management quantities, as reported in Section 6 of the Form R (Section 6.2)
- On-site release and other waste management activities as reported in Section 7 of the Form R (Section 6.3)
- Production ratio/activity index (Section 6.4)
- Source reduction (Section 6.5)

A discussion of the methodology used by the site surveyors to gather the data necessary to estimate the release and other waste management quantities is contained in Section 2. A discussion of the specific techniques used by the facilities and by the site surveyors when estimating release and other waste management quantities is presented in Section 5.

Facilities are required to report estimates of release and other waste management by chemical for each release and other waste management activity type. On-site release and other waste management activities (as reported in Section 5 and Section 8.1 of the Form R) must be apportioned among the following five categories:

— Fugitive or non-point air emissions;
— Stack or point air emissions;
— Discharges to receiving streams or water bodies;
— Underground injection on site; or
— Releases to land on site.

Off-site transfers for release and other waste management activities (as reported in Section 6 and Sections 8.3, 8.5, and 8.7 of the Form R) are categorized according to how the waste is managed:

- Discharges to POTWs;
- Off-site transfer for disposal;
- Off-site transfer for treatment;
- Off-site transfer for recycling; and
- Off-site transfer for energy recovery.

Facilities also report on their on-site waste management activities in Sections 7, 8.2, 8.4, and 8.6 of the Form R according to these type categories:

- On-site treatment;
- On-site recycling; and
- On-site energy recovery.

6.1 Estimates of On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R

Section 6.1.1 compares the estimates of on-site release and other waste management quantities between the facilities and surveyors. Section 6.1.2 compares the scaled up facility estimates to the TRI database.

6.1.1 Comparison of the Facility Estimates to the Surveyor Estimates

To assess the accuracy of the estimates reported by the facilities, the facility estimates for each medium were compared to those calculated by the site surveyors. First, the chemical-specific estimates were summed at the facility level for each release and transfer medium. Next, the estimates were totaled by type for facilities in the SIC Codes 33, 36, and 37. These totals for each of the SIC Codes were compared to evaluate overall accuracy within and among the industries. Because the chemical-specific estimates are combined by type, the accuracy of site-specific estimates for each chemical at each facility is not evaluated in this report. Such information was provided to the facility at the time of the site visit.

Tables 6-1a through 6-1c show the percent difference between the facility estimates and the site surveyor estimates for each release and transfer medium in Section 5 of the Form R for SIC Codes 33, 36, and 37. The percent difference is calculated as:

$$\text{Percent Difference} = (Fa - SS)/(SS) \times 100$$

where: Fa = Facility Estimate
SS = Site Surveyor Estimate

The site surveyor estimates were used as the basis for comparison as they are a more accurate representation of "true value" than the facility estimates. Negative percent difference values indicate that, overall, the facilities surveyed underestimated the release or other waste management activity, while positive values indicate an overestimate. These differences are depicted graphically in Figures 6-1a through 6-1c. Note that none of the surveyed facilities had transfers to underground injection.

Figures 6-2a through 6-2c illustrate the percentage of facility estimates which were greater than, equal to within 5%, or less than the surveyor estimates for SIC Codes 33, 36, and 37, respectively. The number of facilities with each type is given in parentheses below each release and other waste management activity type.

Release and Other Waste Management Estimates in the Primary Metals Industry, SIC Code 33

For the primary metals industry, SIC Code 33, 27 facilities were surveyed and estimates for 74 EPCRA Section 313 chemicals were reviewed. Comparing the facility estimates to the site surveyor estimates (Table 6-1a), the largest discrepancies in total pounds are for on site land disposal (480%). For on-site land disposal, the large difference can be attributed to one facility. This facility completed the wrong column on the Form R and should have reported the chemical as sent off-site for disposal. The closest agreement is for discharges to receiving streams or other bodies of water at 0.5% (based on five facilities). The total percent difference for all on-site release and other waste management activities in this SIC Code is 0.22%.

Release and Other Waste Management Estimates in the Electronic and Other Electrical Equipment Industry, SIC Code 36

In the electronic and other electrical equipment industry, SIC Code 36, a total of 14 facilities were surveyed. Site surveyors reviewed and estimated release and other waste management activities for 48 EPCRA Section 313 reports. The range of the percent differences in the estimates in SIC Code 33, is 1.5 to 53.1% (see Table 6-1b). The total percent difference for all on-site release and other waste management activities in the SIC Code is -24.5%.

Release and Other Waste Management Estimates in the Transportation Equipment Industry, SIC Code 37

A total of 19 facilities were surveyed in the transportation equipment industry, SIC Code 37, and 64 EPCRA Section 313 reports reviewed. Total estimates for each type by facility are within 10% of the site surveyor estimates, with the exception of on-site land disposal which differed by 212% (see Table 6-1c). Note, however, that total releases of this type were only 255 pounds at the facilities visited.

Table 6-1a

Summary of SIC Code 33 On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R[a]

Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
Fugitive air	0.112	0.121	-7.75%
Stack air	0.784	0.797	-1.63%
Receiving stream	4.55E-03	4.53E-03	0.541%
Land on site	0.029	0.005	480%
Total	0.930	0.928	0.22%

[a]Number of facilities = 27; number of EPCRA Section 313 reports represented = 74.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.

Table 6-1b

Summary of SIC Code 36 On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R[a]

Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
Fugitive air	0.027	0.022	22.9%
Stack air	0.045	0.074	-39.4%
Receiving stream	6.36E-04	6.26E-04	1.52%
Land on site	1.35E-03	8.80E-04	53.1%
Total	0.074	0.098	-24.5%

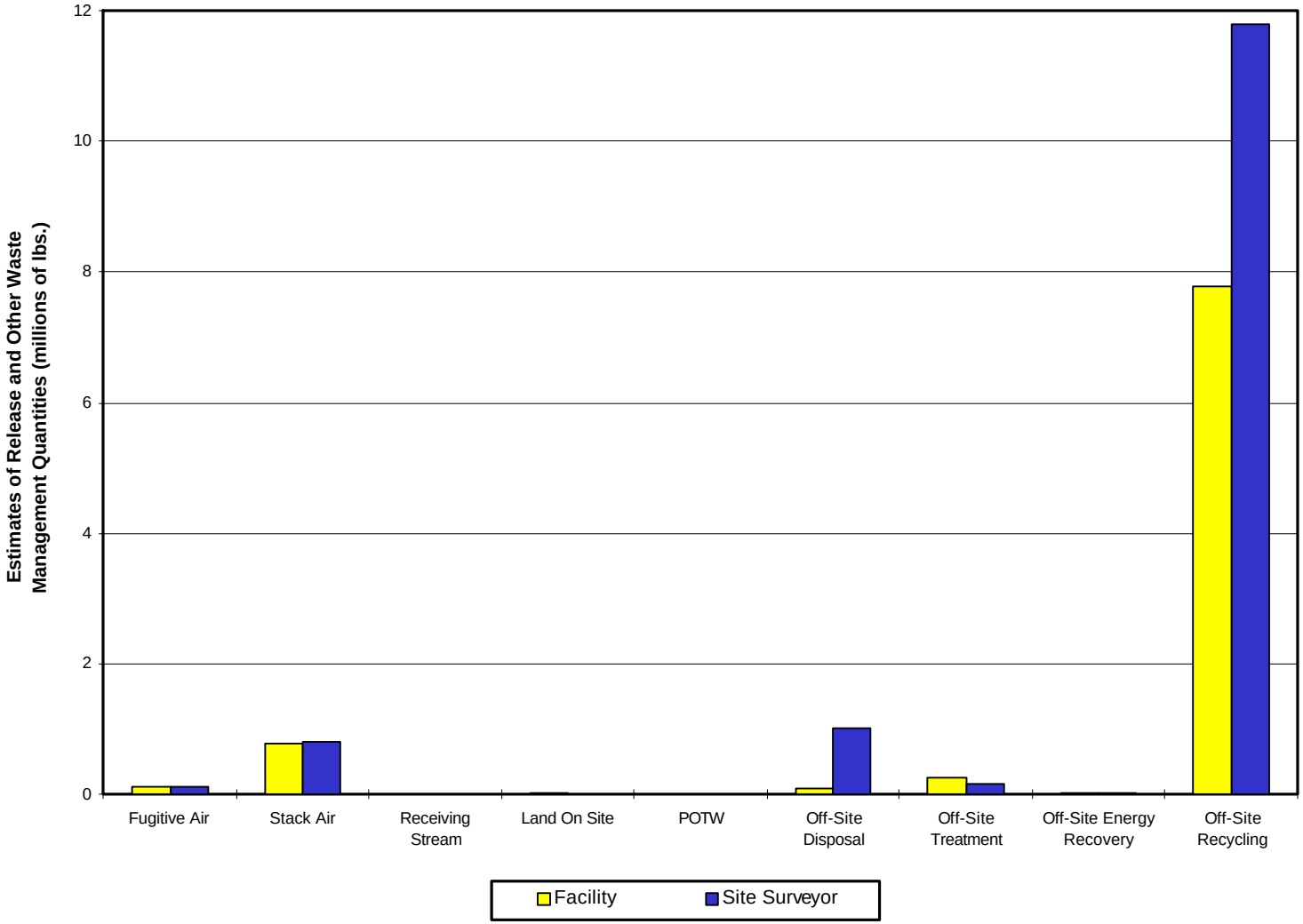
[a]Number of facilities = 14; number of EPCRA Section 313 reports represented = 48.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.

Table 6-1c

Summary of SIC Code 37 On-Site Release and Other Waste Management Quantities as Reported in Sections 5 of the Form R[a]

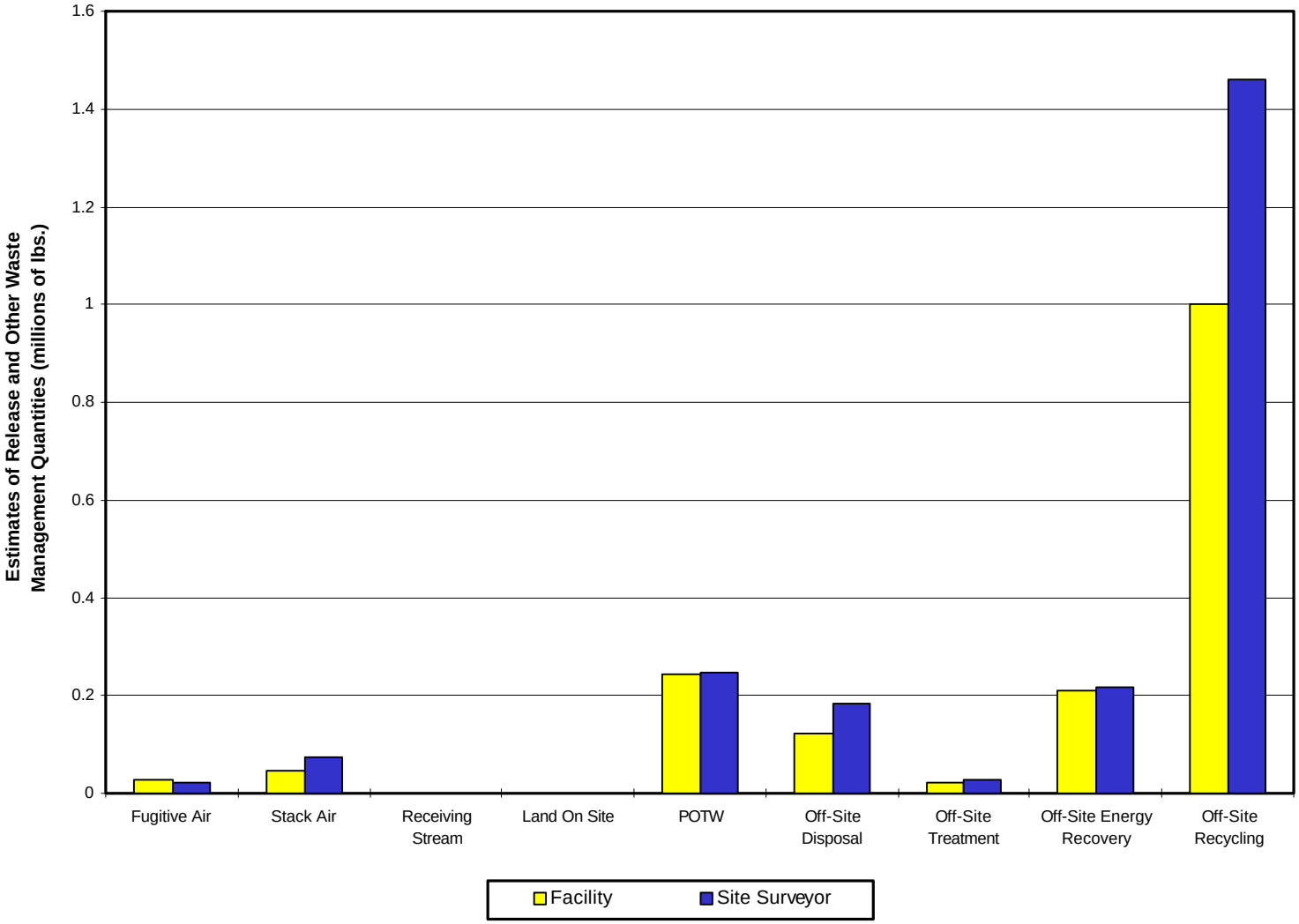
Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
Fugitive air	0.268	0.297	-9.96%
Stack air	1.08	1.11	-2.78%
Receiving stream	0.0	0.0	0%
Land on site	7.96E-04	2.55E-04	212%
Total	1.35	1.41	-4.26%

[a]Number of facilities = 19; number of EPCRA Section 313 reports represented = 64.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.



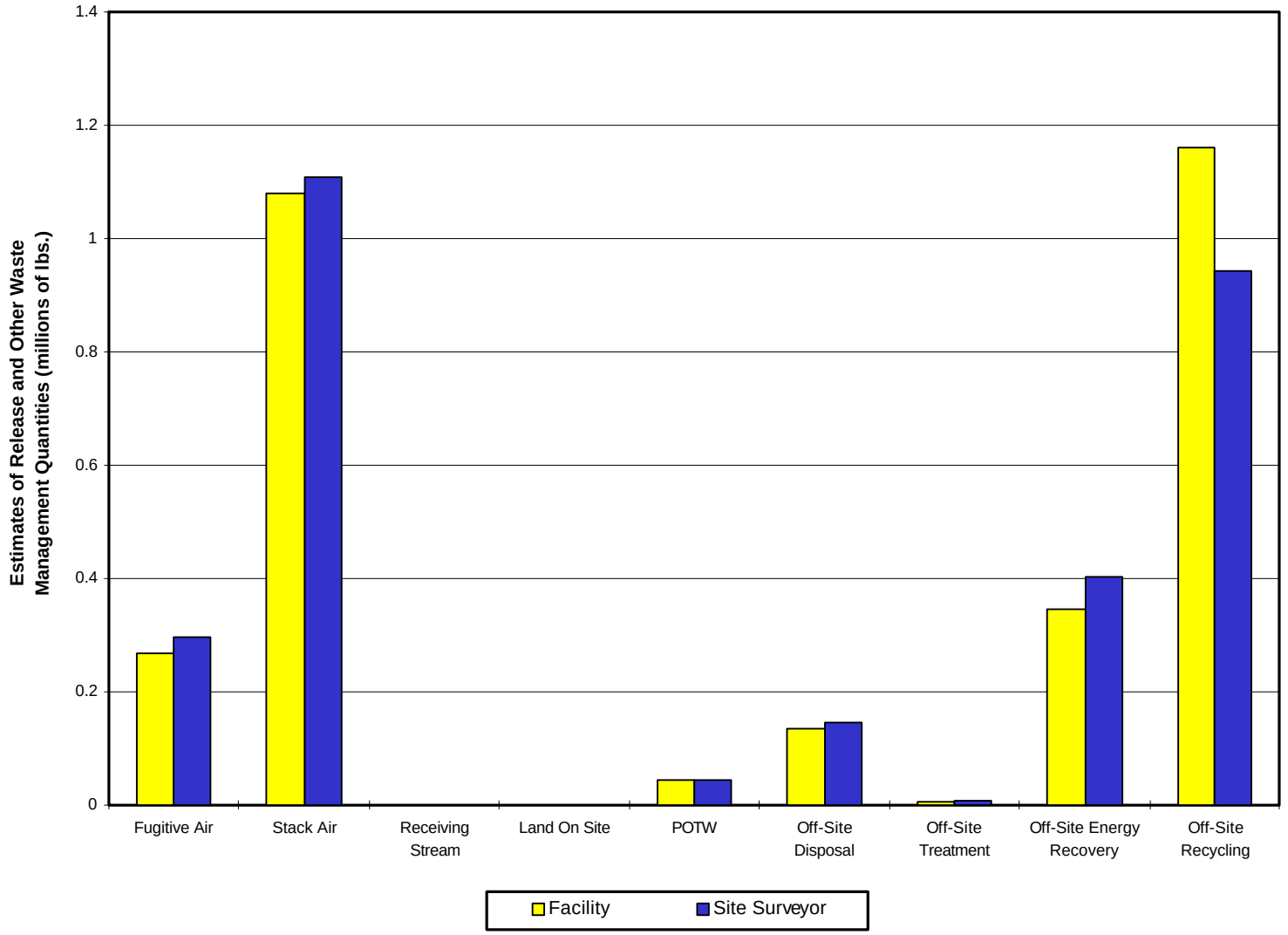
Data for this figure can be found on Tables 6-1a and 6-4a.

Figure 6-1a. Comparison of Estimates of Total Release and Other Waste Management Quantities as Reported in Sections 5 and 6 of the Form R in SIC Code 33



Data for this figure can be found on Tables 6-1b and 6-4b.

Figure 6-1b. Comparison of Estimates of Total Release and Other Waste Management Quantities as Reported in Sections 5 and 6 of the Form R in SIC Code 36



Data for this figure can be found on Tables 6-1c and 6-4c.

Figure 6-1c. Comparison of Estimates of Total Release and Other Waste Management Quantities as Reported in Sections 5 and 6 of the Form R in SIC Code 37

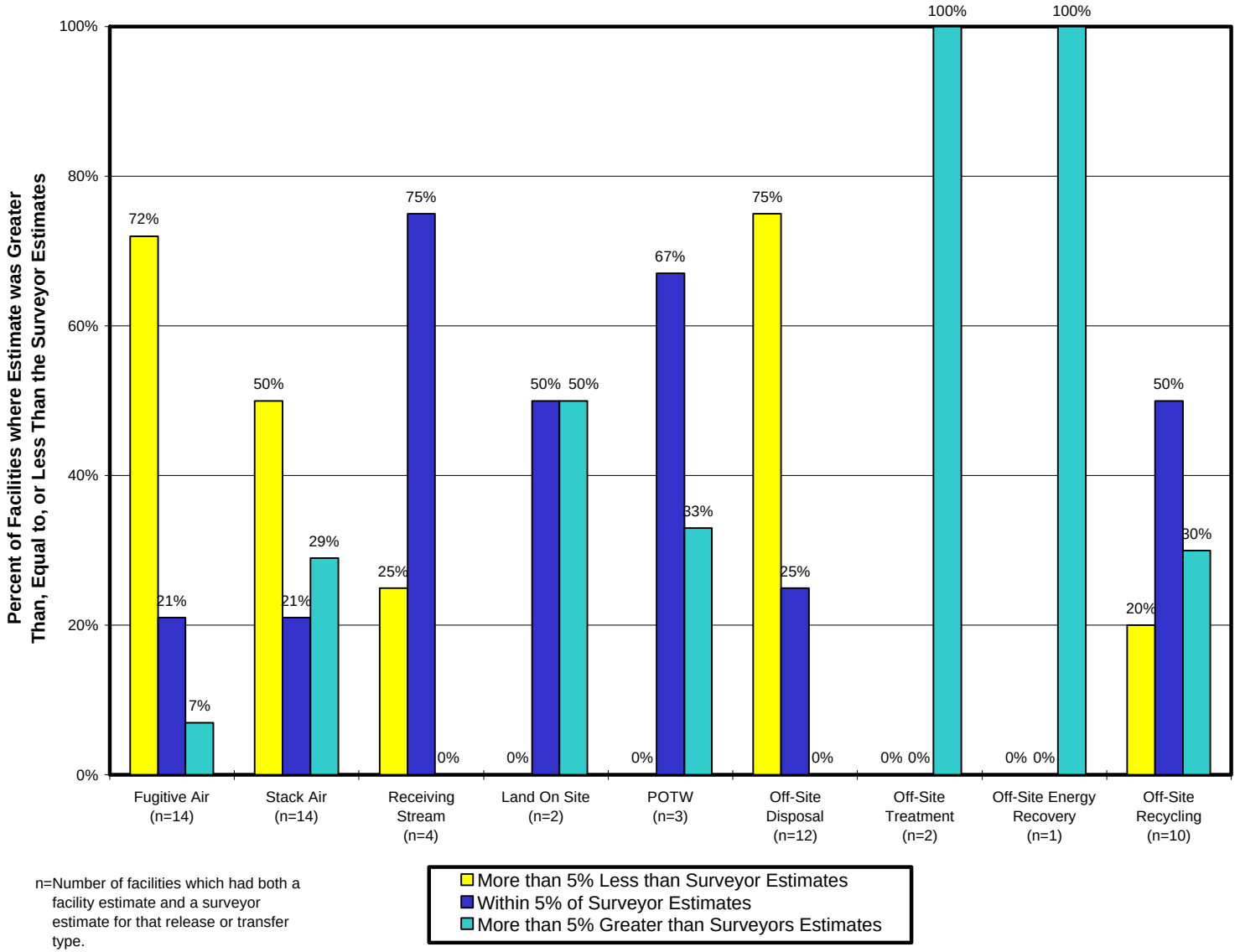


Figure 6-2a. Frequency of Agreement Between Facility and Surveyor Estimates by Release and Other Waste Management Activity Type for SIC Code 33

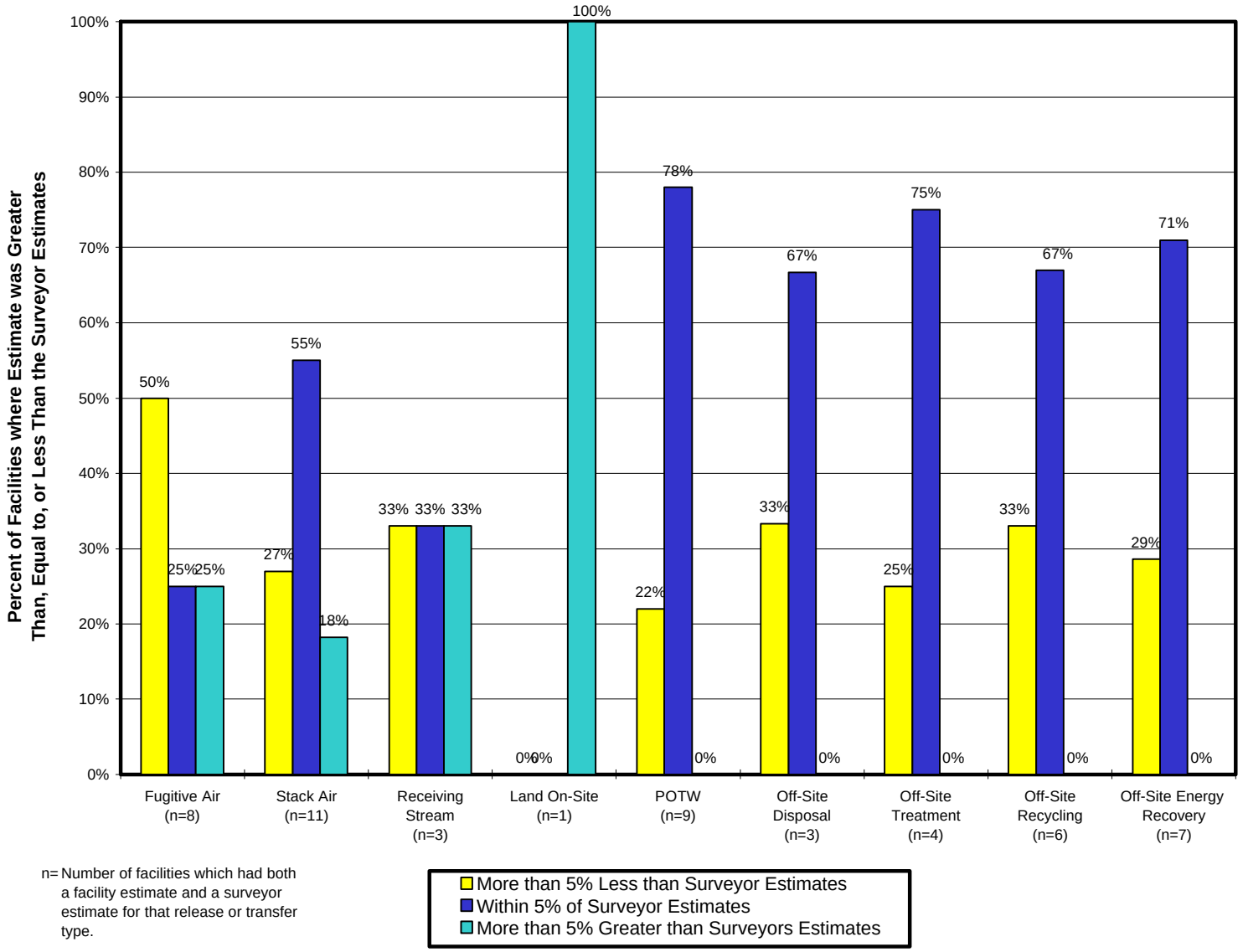


Figure 6-2b. Frequency of Agreement Between Facility and Surveyor Estimates by Release and Other Waste Management ActivityType for SIC Code 36

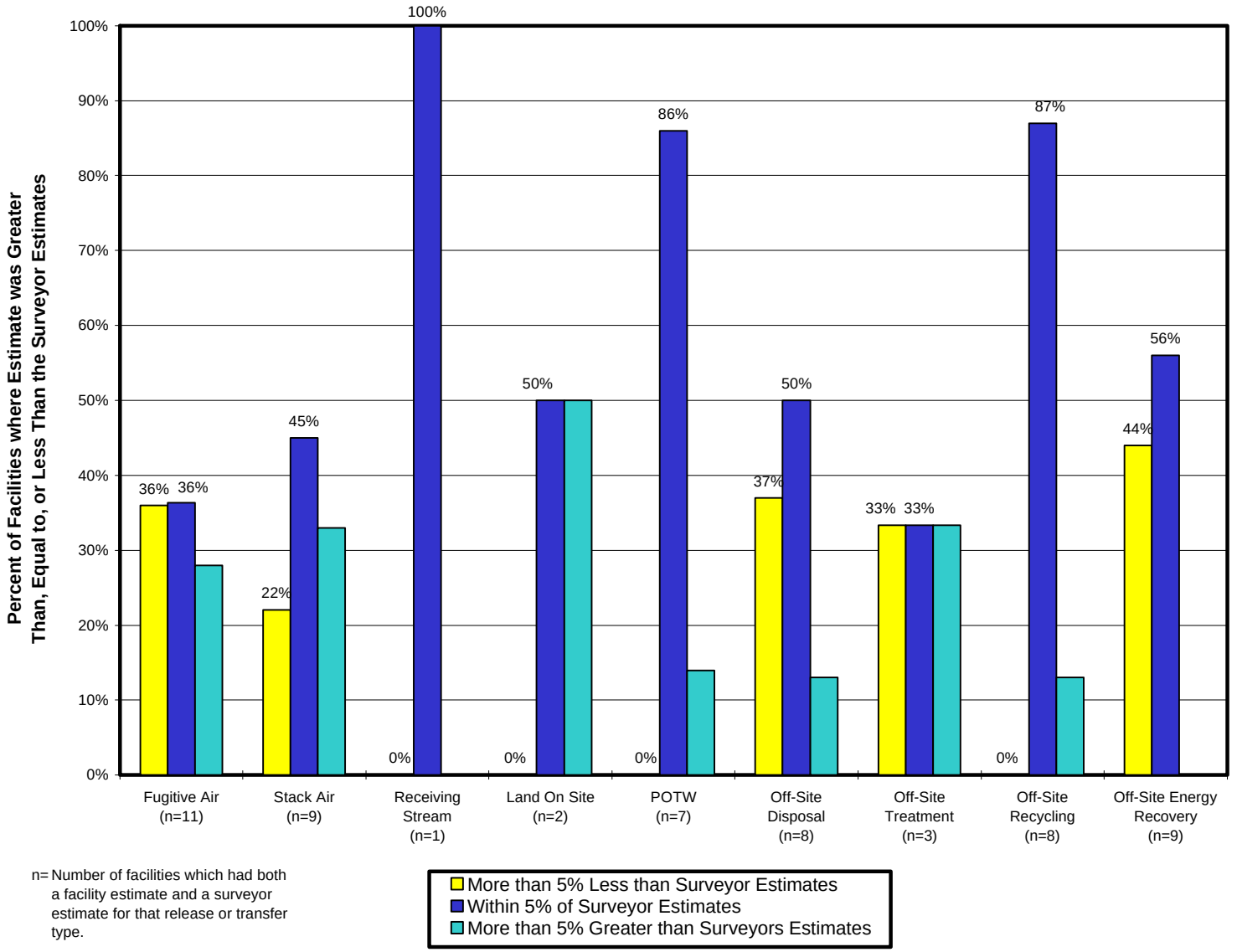


Figure 6-2c. Frequency of Agreement Between Facility and Surveyor Estimates by Release and Other Waste Management Activity Type for SIC Code 37

Summary of On-Site Release and Other Waste Management Estimates in all Three SIC Codes

Table 6-2 summarizes the differences in on-site release and other waste management quantities for all three SIC Codes. The high percent differences for on-site disposal to land are due to errors from a few facilities, as explained above. The overall magnitude of these errors is small, and does not contribute significantly to the total release and other waste management quantities.

Table 6-2

Comparison of Differences Between Facility Estimates and Site Surveyor Estimates Across the SIC Codes

Medium	Percent Difference for SIC Code 33	Percent Difference for SIC Code 36	Percent Difference for SIC Code 37
Fugitive air	-7.75%	22.9%	-9.96%
Stack air	-1.63%	-39.4%	-2.78%
Receiving stream	0.54%	1.52%	0.0%
Land on site	432%	53.1%	212%
Total	0.22%	-24.5%	-4.26%

Note: Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

6.1.2 Comparison of the Facilities Surveyed to the National TRI Database

Estimates made by surveyed facilities were compared to national estimates in the TRI database to determine how closely the release and other waste management quantities reported by the surveyed population matched the national population. To make this comparison, the estimates of the surveyed facilities were scaled-up to place them on the same basis as the national estimates. The scale-up factor used is the ratio of the number of Form Rs reported by the surveyed facilities to the number of Form Rs submitted to the TRI database by all the facilities in the SIC Codes visited. Only release and other waste management quantities from facilities with 15 or fewer Form Rs were included in the national estimates, since this was also a selection criteria when identifying facilities to visit (see discussion in Section 2). Tables 6-3a through 6-3c show this comparison and the percent differences for SIC Codes 33, 36, and 37, respectively. A comparison of transfers to underground injection has not been made since none of the facilities surveyed used underground injection systems. The percent difference is calculated as:

$$\text{Percent Difference} = (Fa - TRI)/(TRI) \times 100$$

where: Fa = Scaled Facility Estimate
TRI = Total Releases and Transfers Reported in TRI database

The TRI database values have been used as the basis for comparison as these data are being used nationwide.

Table 6-3a

Comparison of Scaled On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R for the Facilities Surveyed to the TRI Database, SIC Code 33

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 331, 332, 333, 334, 335) (million pounds)	Percent Difference[b] Facility: TRI
Fugitive Air	7.22	39.9	-81.9%
Stack Air	50.6	108	-53.2%
Receiving Stream	0.294	32.3	-99.1%
On Site Disposal	1.89	215	-99.1%
Total	60	395	-84.8%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

Overall, there are substantial differences between the scaled-up release and other waste management quantities from the surveyed facilities compared to national estimates in the TRI database. We believe this finding relates to the voluntary nature of the program. Anecdotal evidence suggests that smaller companies and facilities have been more willing to participate in the survey program, and larger companies and facilities have a greater tendency to decline to participate. Further examination of the TRI database records of facilities that declined to participate in the site survey program for RY 1996 indicates they had approximately five times the amount of release and other waste management quantities per Form R than those that volunteered to participate in the survey. Thus, the difference in the release and other waste management estimates between the surveyed facilities and the national estimates reflect that surveyed facilities tended to have lower throughput, on average, than the industry as a whole.

Table 6-3b

Comparison of Scaled On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R for the Facilities Surveyed to the TRI Database, SIC Code 36

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 367 and 369) (million pounds)	Percent Difference[b] Facility: TRI
Fugitive air	1.73	3.22	-46.2%
Stack air	2.90	7.91	-63.4%
Receiving stream	0.041	1.39	-97.1%
On Site disposal	0.087	0.299	-70.9%
Total	4.76	12.8	-62.8%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

Table 6-3c

Comparison of Scaled On-Site Release and Other Waste Management Quantities as Reported in Section 5 of the Form R for the Facilities Surveyed to the TRI Database, SIC Code 37

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 371 and 372) (million pounds)	Percent Difference[b] Facility: TRI
Fugitive air	17.3	16.2	6.55%
Stack air	69.6	66.6	4.53%
Receiving stream	0.0	0.275	-100%
On site disposal	0.051	0.69	-92.6%
Total	87.0	83.8	3.82%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

6.2 Estimates of Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R

Section 6.2.1 compares the estimates of off-site release and other waste management quantities between the facilities and surveyors. Section 6.2.2 compares the scaled up facility estimates to the TRI database.

6.2.1 Comparison of the Facility Estimates to the Surveyor Estimates

To assess the accuracy of the estimates reported by the facilities, the facility estimates for each medium were compared to those calculated by the site surveyors. This was done in the same manner that the on-site releases and waste management quantities were tabulated.

Tables 6-4a through 6-4c show the percent difference between the facility estimates and the site surveyor estimates for each off-site release and transfer medium in Section 6 of the Form R for SIC Codes 33, 36, and 37. The percent difference is calculated as:

$$\text{Percent Difference} = (Fa - SS)/(SS) \times 100$$

where: Fa = Facility Estimate
SS = Site Surveyor Estimate

The site surveyor estimates were used as the basis for comparison as they are a more accurate representation of "true value" than the facility estimates. Negative percent difference values indicate that, overall, the facilities surveyed underestimated the release or other waste management activity, while positive values indicate an overestimate. These differences are depicted graphically in Figures 6-1a through 6-1c. Note that none of the surveyed facilities had transfers to underground injection.

Figures 6-2a through 6-2c illustrate the percentage of facility estimates which were greater than, equal to within 5%, or less than the surveyor estimates for SIC Codes 33, 36, and 37, respectively. The number of facilities with each type is given in parentheses below each release and other waste management activity type.

Release and Other Waste Management Estimates in the Primary Metals Industry, SIC Code 33

For the primary metals industry, SIC Code 33, 27 facilities were surveyed and estimates for 74 EPCRA Section 313 chemicals were reviewed. Comparing the facility estimates to the site surveyor estimates (Table 6-4a), the largest discrepancies in total pounds are for transfers off site disposal (-91.4%), transfers off site for treatment (73.4%), and discharges to POTWs (50%). The total percent difference for all off-site release and other waste management activities in this SIC Code is -37.3%.

In the case of off-site disposal, estimates were reported by 12 facilities from all five of the three-digit SIC Code 33 facilities surveyed; nine of these facilities underestimated the quantity sent off site for further waste management. Two facilities account for much of the difference. One incorrectly thought copper qualified for the article exemption; this facility disposed of large amounts of copper at an off-site landfill, negating the exemption. The second miscalculated the percent of a metal sent to an off-site landfill. Because the total amount of waste landfilled was high in both cases, the amount underestimated was large. An additional seven should have reported greater release quantities to this type, which results in a large discrepancy between the totals for the facility and surveyor estimates.

In the case of chemicals sent off site for treatment, one facility greatly overestimated its transfers for two reasons: the facility incorrectly assumed the metals in waste transferred off site were treated instead of being disposed, and they miscalculated the amount of nitric acid produced, thus overestimating the quantity treated. For discharges to POTWs, one facility accounts for the discrepancy by reporting releases (Code A, 1-10 pounds) where they should not have. The chemical was zinc which in this case would not be released as a dust or fume to the POTW. Note that although this contributes a 50% error in the quantity sent to POTWs, the size of the error is orders of magnitude smaller than that of other types.

Figure 6-1a shows the impact of the estimating differences on the amounts of chemicals released and otherwise managed as waste. The errors in the estimates of off-site transfers are the most significant. The 4 million pound difference in off-site recycling estimates between the facilities and surveyors accounts for 83% of the difference in the total off-site release

and other waste management quantities in SIC Code 33. The difference can be attributed to one facility overlooking 4 million pounds of metal in slag that was sent to an off-site recycler for further use in road maintenance.

As presented in Figure 6-2a, the majority of the air releases and off-site transfers for disposal were underestimated. Transfers for off-site treatment and off-site energy recovery tended to be overestimated.

Table 6-4a
Summary of SIC Code 33 Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R[a]

Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
POTW	1.65E-05	1.10E-05	50%
Off-site disposal	0.086	1.005	-91.4%
Off-site treatment	0.261	0.150	73.4%
Off-site energy recovery	0.030	0.022	37.5%
Off-site recycling	7.77	11.8	-34.1%
Total	8.15	13.0	-37.3%

[a]Number of facilities = 27; number of EPCRA Section 313 reports represented = 74.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.

Table 6-4b
Summary of SIC Code 36 Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R[a]

Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
POTW	0.243	0.246	-1.23%
Off-site disposal	0.121	0.182	-33.3%
Off-site treatment	0.020	0.026	-21.7%
Off-site energy recovery	0.211	0.215	-2.16%
Off-site recycling	1.00	1.46	-31.5%
Total	1.60	2.13	-24.9%

[a]Number of facilities = 14; number of EPCRA Section 313 reports represented = 48.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.

Table 6-4c

Summary of SIC Code 37 Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R[a]

Type[b]	Release and Other Waste Management Quantities Reported by the Facilities (million pounds)	Release and Other Waste Management Quantities Estimated by the Surveyors (million pounds)	Percent Difference[c]
POTW	0.045	0.045	0%
Off-site disposal	0.136	0.146	-6.57%
Off-site treatment	0.006	0.007	-10.82%
Off-site energy recovery	0.346	0.403	-14.1%
Off-site recycling	1.16	0.942	22.9%
Total	1.69	1.54	9.74%

[a]Number of facilities = 19; number of EPCRA Section 313 reports represented = 64.
[b]No underground injection was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
Note: Due to rounding, calculated values may not yield exact numbers.

Release and Other Waste Management Estimates in the Electronic and Other Electrical Equipment Industry, SIC Code 36

In the electronic and other electrical equipment industry, SIC Code 36, a total of 14 facilities were surveyed. Site surveyors reviewed and estimated release and other waste management quantities for 48 EPCRA Section 313 reports. The total percent difference for all off-site release and other waste management activities in this SIC Code is -24.9% (see Table 6-4b).

As with the primary metals industry, errors in the off-site transfers have the greatest consequence on the total estimate of release and other waste management quantities (see Figure 6-1b). Two facilities underestimated off-site recycling by a significant amount. One facility failed to report for copper (overlooking the chemical entirely), accounting for 25,000 pounds of the difference. The other facility assumed all metals were directly reused when taken off site when some were managed and then recycled. Similar to the primary metals industry, the 460,000 pound difference in off-site recycling between the facility and surveyors estimates accounts for 87% of the difference in the total off-site release and other waste management quantities in SIC Code 36.

Release and Other Waste Management Estimates in the Transportation Equipment Industry, SIC Code 37

A total of 19 facilities were surveyed in the transportation equipment industry, SIC Code 37, and 64 EPCRA Section 313 reports reviewed. Total estimates for each type by facility are within 25% of the site surveyor estimates (see Table 6-4c). Of the three SIC Codes surveyed, this SIC Code shows the best overall agreement with a total percent difference of off-site releases and waste management quantities of 9.7%. The most significant impact in terms of the error in the overall amount of release and other waste management activities is again due to the inaccuracies in estimating the off-site transfers to recycling (see Figure 6-1c). One facility significantly overestimated off-site recycling of metals due to the fact that most of this metal was directly reused.

Summary of Off-Site Release and Other Waste Management Estimates in all Three SIC Codes

Table 6-5 summarizes the differences in off-site release estimates and waste management quantities for all three SIC Codes. Figure 6-3 presents the sum of the total (on-site and off-site) release and waste management quantities for each SIC Code graphically.

Overall, off-site transfers to recycling, disposal, and treatment were the most problematic to estimate for all the SIC Codes. Because these transfer types account for a large portion of the total quantity of release and other waste management activities, improving on these estimates would improve the accuracy of the total estimates reported.

The main reason for the difficulty facilities had estimating off-site transfers to recycling relates to differentiating between "reuse" and "recycle". Facilities felt that definitions for these were not clearly stated in the reporting instructions in general, nor do they address specific concerns that are unique to these SIC Codes. In particular, these definitions were perceived to be unclear as they apply to metals and metal compounds present in scrap, off-specification product, dust, slag, and other spent process streams that are subsequently used by other facilities.

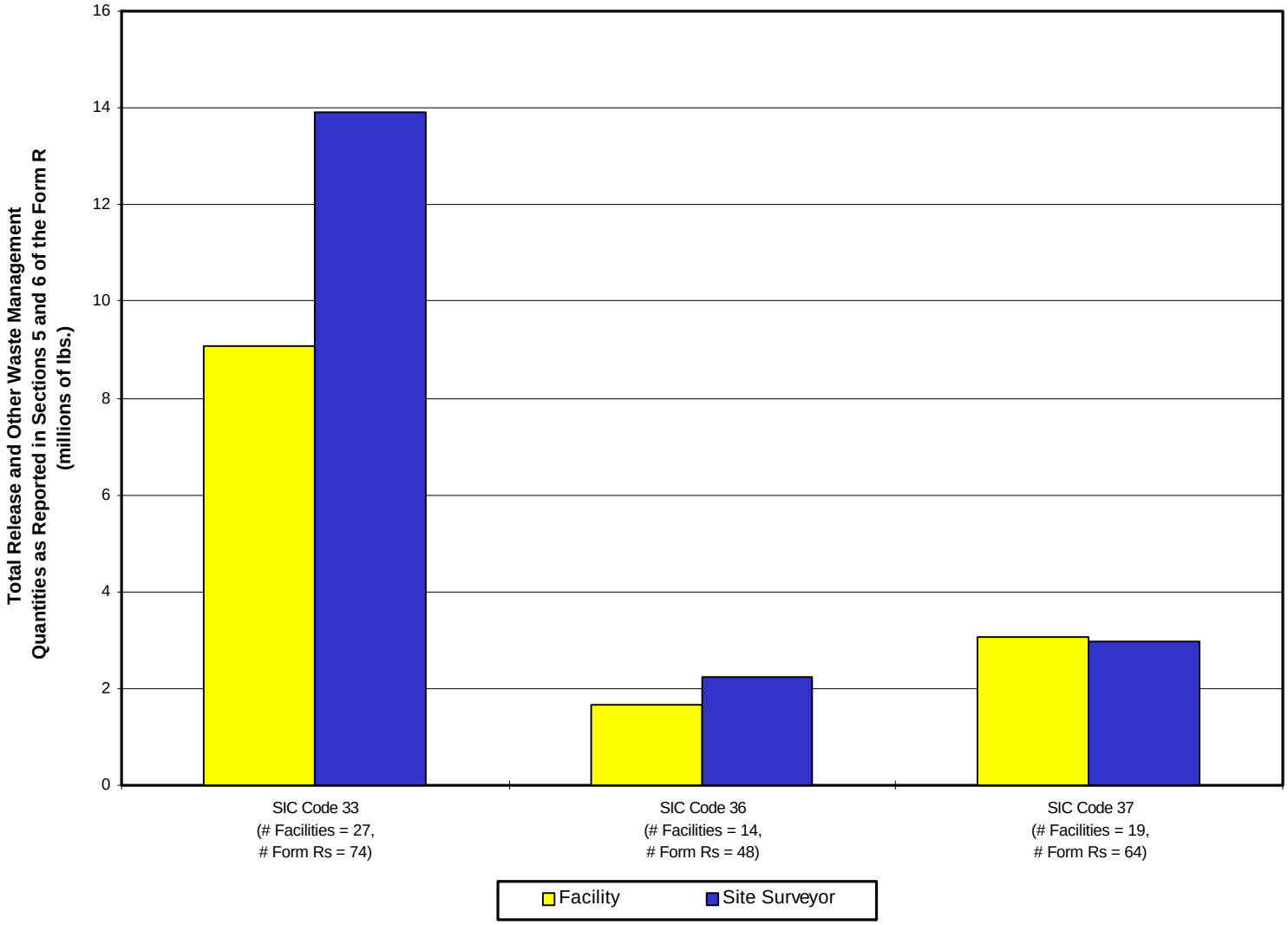
Some facilities reported confusion based on the EPA issue paper, *Clarification and Guidance for the Metal Fabrication Industry, January 1990*. This guidance was issued prior to inclusion of Section 8 of the Form R and states that amounts sent off site for recycling should not be reported, which is incorrect under current reporting requirements. The document also references EPA's *Toxic Chemical Release Inventory Questions and Answers: 1990 Update*, which also contains some outdated information. Efforts are currently underway to revise the metal fabrication and electroplating guidance documents, and updated guidance should be available within the next year.

Table 6-5

Comparison of Differences Between Facility Estimates and Site Surveyor Estimates Across the SIC Codes

Medium	Percent Difference for SIC Code 33	Percent Difference for SIC Code 36	Percent Difference for SIC Code 37
POTW	50.0%	-1.23%	0%
Off-site disposal	-91.4%	-33.3%	-6.57%
Off-site treatment	73.4%	-21.7%	-10.8%
Off-site energy recovery	37.5%	-2.16%	-14.1%
Off-site recycling	-34.1%	-31.5%	22.9%
Total	-37.3%	-24.9%	9.74%

Note: Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.



Data for this figure can be found on Tables 6-1a through 6-1c.

Figure 6-3. Comparison of Facility and Site Surveyor Estimates of Total Release and Other Waste Management Quantities as Reported in Sections 5 and 6 of the Form R.

A secondary reason for inaccuracies in the estimates of off-site transfers is due to facilities mistakenly assuming metals sent off site in waste that are treated rather than disposed. This assumption causes some treatment estimates to be overestimated, and the corresponding disposal to be underestimated. Another discrepancy is that facilities did not always know the fate of waste removed from the site and incorrectly assumed recycling. Unless facilities had supporting documentation of these waste management practices, the site surveyors considered these transfers to be sent for disposal. Again, disposal would be underestimated and off-site transfers for recycling would be overestimated when this occurred.

As an indication of how industries surveyed this year compare to those surveyed in previous years, the overall percent differences are presented in Table 6-6. (These percent differences account for all on-site and off-site release and other waste management quantities.) This comparison suggests that industries in SIC Codes 33, 36, and 37 have less accurate reporting. On closer evaluation, industries in SIC Code 33 account for much of the 28% difference, and SIC Code 36 to a lesser extent. Industries in SIC Code 37 at 3% difference are comparable to the facilities in the SIC Codes from previous years.

Industry confusion over the definitions of recycling and reuse is the main reason for the 28% difference in facility and surveyor estimates in SIC Code 33. The magnitude of the difference in estimates is due to the large amount of throughput, use, and reuse of metals in this industry. In addition to providing guidance on recycling and reuse, industry-specific guidance appears warranted.

Table 6-6

Percent Difference of Facility and Site Surveyor Estimated Total Release and Other Waste Management Quantities as Reported in Sections 5 and 6 of the Form R for Reporting Years 1996, 1995, 1994, 1988, and 1987

Reporting Year	SIC Codes Surveyed	Percent Difference
1996	331, 332, 333, 334, 335, 367, 369, 371, 372	-28%
1995	26, 286	-1.2%
1994	25, 281, 285, 30	-6.7%
1988	28, 291, 34 through 38	1.1%
1987	20 through 39	-2.2%

6.2.2 Comparison of the Facilities Surveyed to the National TRI Database

Estimates made by surveyed facilities were compared to national estimates in the TRI database to determine how closely the release and other waste management quantities reported by the surveyed population matched the national population. To make this comparison, the estimates of the surveyed facilities were scaled-up to place them on the same basis as the national estimates. The scale-up factor used is the ratio of the number of Form Rs reported by the surveyed facilities to the number of Form Rs submitted to the TRI database by all the facilities in the SIC Codes visited. Only release and other waste management quantities from facilities with 15 or fewer Form Rs were included in the national estimates, since this was also a selection criteria when identifying facilities to visit (see discussion in Section 2). Tables 6-7a through 6-7c show this comparison and the percent differences for SIC Codes 33, 36, and 37, respectively.

Percent Difference = (Fa - TRI)/(TRI) x 100

where: Fa = Scaled Facility Estimate
TRI = Total Release and Other Waste Management Quantities Reported in TRI database

The TRI database values have been used as the basis for comparison as these data are being used nationwide.

Table 6-7a

Comparison of Scaled Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R by the Facilities Surveyed to the TRI Database, SIC Code 33

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 331, 332, 333, 334, 335) (million pounds)	Percent Difference[b] Facility: TRI
POTW	0.001	5.49	-100%
Off-Site Transfers	526	1,067	-50.7%
Total	526	1,072	-50.9%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

Overall, there are substantial differences between the scaled-up release and other waste management quantities from the surveyed facilities compared to national estimates in the TRI database. We believe this finding relates to the voluntary nature of the program. Anecdotal evidence suggests that smaller companies and facilities have been more willing to participate in the survey program, and larger companies and facilities have a greater tendency to decline to participate. Further examination of the TRI database records of facilities that declined to participate in the site survey program for RY 1996 indicates they had approximately five times the amount of release and other waste management quantities per Form R than those that volunteered to participate in the survey. Thus, the difference in the release and other waste management estimates between the surveyed facilities and the national estimates reflect that surveyed facilities tended to have lower throughput, on average, than the industry as a whole.

Table 6-7b

Comparison of Scaled Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R for the Facilities Surveyed to the TRI Database, SIC Code 36

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 367 and 369) (million pounds)	Percent Difference[b] Facility: TRI
POTW	15.7	12.0	30.1%
Off-site transfers	87.3	324	-73.1%
Total	103	336	-69.3%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

Table 6-7c

Comparison of Scaled Off-Site Release and Other Waste Management Quantities as Reported in Section 6 of the Form R for the Facilities Surveyed to the TRI Database, SIC Code 37

Type[a]	Scaled Release and Other Waste Management Quantities Reported by Surveyed Facilities (million pounds)	Total Reported Nationwide (SIC Codes 371 and 372) (million pounds)	Percent Difference[b] Facility: TRI
POTW	2.91	6.99	-58.4%
Off-site transfers	106	193	-45.1%
Total	109	200	-45.5%

[a]No underground injection was reported.
[b]Percent difference = (Fa-TRI)/(TRI) x 100, where Fa=Scaled Facility Estimate and TRI=Total Release Estimate as Reported in the TRI database.

6.3 Estimates of On-Site Waste Management Quantities as Reported in Sections 7, 8.2, 8.4, and 8.6 of the Form R

In addition to evaluating the accuracy of the on-site releases and off-site transfers to disposal, treatment, energy recovery, and recycling. Site surveyors also reviewed facility estimates for EPCRA Section 313 chemicals in on-site waste management activities. Comparisons of the percent differences are made between the facility and the surveyor estimates for each of the three SIC Codes and each of the three waste management types: treatment, energy recovery, and recycling.

To calculate the percent difference, the amounts of EPCRA Section 313 chemicals in waste managed on site estimated by the facilities and the site surveyors were summed to determine totals for each waste management type at each facility. Totals for each facility were then summed for all facilities in each SIC Code. These totals are presented in Tables 6-8a through 6-8c. The percent difference is calculated as:

$$\text{percent difference} = (Fa - SS)/(SS) \times 100$$

where: Fa = facility estimate

SS = site surveyor estimate

The site surveyor estimates were used as the basis for comparison as they are a more accurate representation of "true value" than the facility estimates.

6.3.1 Comparison of the Facility Estimates to the Surveyor Estimates

In general, most facilities in SIC codes 33 and 36 expressed considerable confusion over reporting for on-site waste management activities. This resulted in significant quantitative errors on a facility basis. However, the total amount of EPCRA Section 313 chemicals managed as waste on site is relatively small compared to quantities released and transferred off site for further waste management. Therefore, these errors do not significantly affect the overall estimates in the TRI database. Facilities in SIC code 37 also expressed confusion, but to a much lesser degree.

Of the 27 facilities surveyed, only one reported a quantity greater than zero for on-site treatment (some correctly reported a quantity of zero). Site surveyors found this facility significantly underestimated the quantity treated (destroyed) and that three other facilities overlooked significant quantities. Additionally, as discussed in Section 4, several facilities failed to report on-site treatment or removal of metals in Section 7A of the Form R due to confusion regarding whether removal of metals from a process wastestream should be considered. Most of these facilities also expressed confusion regarding the percent efficiency that should be entered in these situations; destruction efficiency (0%) or removal efficiency (typically 99%). *[The 1996 TRI instructions say that the waste treatment efficiency reported must represent physical removal of the parent metal from the waste stream, p.41. It should be noted , however, that Section 8.6 of the Form R asks for the amount destroyed in on-site treatment. Therefore, the correct amount for metals treatment in this Section 8.6 is zero.]*

Only one facility reported a quantity sent to energy recovery. This was expected because facilities in the primary metals industry rarely employ energy recovery systems for EPCRA Section 313 chemicals, partly because most recycle or reuse activities relate to metals and metal compounds, which do not have a heat content high enough to sustain combustion. In this particular case, the site surveyor determined that the EPCRA Section 313 chemicals were directly reused, not sent to energy recovery.

Four facilities reported on-site recycling, two of which account for the majority of the total amount reported. One of these reported on-site recycling for a direct reuse activity and the second considerably overestimated the quantity recycled. A fifth facility overlooked a recycling activity entirely.

Table 6-8a

On-Site Waste Management for SIC Code 33[a]

Type	Number of Facilities with On-Site Waste Management	Amount Reported by the Facility (million pounds)	Amount Estimated by the Surveyor (million pounds)	Percent Difference[b]
On-site treatment	4	0.002	0.040	-94.8%
On-site energy recovery	0	0.950	0	--
On-site recycling	4	21.2	6.12	246%
Total		22.2	6.16	260%

[a]Number of facilities = 27, number of EPCRA Section 313 reports represented = 74.
[b]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 6-8b

On-Site Waste Management for SIC Code 36[a]

Type	Number of Facilities with On-Site Waste Management	Amount Reported by the Facility (million pounds)	Amount Estimated by the Surveyor (million pounds)	Percent Difference[b]
On-site treatment	7	0.575	1.40	-59%
On-site energy recovery	2	0.486	0.468	3.81%
On-site recycling	2	12.7	0.065	19,416%
Total		13.7	1.94	610%

[a]Number of facilities = 14, number of EPCRA Section 313 reports represented = 48.
[b]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 6-8c

On-Site Waste Management for SIC Code 37[a]

Type[b]	Number of Facilities with On-Site Waste Management	Amount Reported by the Facility (million pounds)	Amount Estimated by the Surveyor (million pounds)	Percent Difference[c]
On-site treatment	3	0.296	0.302	-2.13%
On-site recycling	2	0.016	0.016	0%
Total		0.311	0.318	-2.02%

[a]Number of facilities = 19, number of EPCRA Section 313 reports represented = 64.
[b]No on-site energy recovery was reported.
[c]Percent Difference = (Fa - SS)/(SS) x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Electronic and Other Electrical Equipment Industry, SIC Code 36

Fourteen facilities from this SIC Code were surveyed. Five of these reported a quantity greater than zero for on-site treatment. Site surveyors determined that four of these underestimated the quantity treated and identified two additional facilities that employed some type of system that resulted in the destruction of an EPCRA Section 313 chemical. The primary reason for the quantitative errors was not confusion about how to report. Rather, site surveyors identified a number of chemicals that were overlooked entirely. Facilities in the electronic and other electrical equipment industry expressed confusion regarding on-site treatment of metals, similar to the confusion in the primary metals industry. However, the "treatment or removal" of metals (dust removal systems in particular) was less prevalent. Therefore, the percent difference is lower. These facilities were more likely to treat mineral acids (via neutralization) or organic chemicals.

Two of the 14 facilities reported on-site energy recovery. Site surveyors did not identify additional energy recovery operations and quantitative estimates were in close agreement. On-site energy recovery is not an area of confusion for SIC code 36.

Three facilities reported on-site recycling activities. These activities resulted in approximately 12.7 million pounds reported in the TRI database. The site surveyors concluded that two of these facilities correctly reported (both the recycling activity and the quantity). However, the third facility incorrectly reported over 12.6 million pounds for recycling that were actually directly reused. As with SIC code 33, this indicates that clarification of the terms "recycle" versus "reuse" will greatly increase the accuracy of the TRI database. It also shows that due to extremely high throughputs, an error by one facility may significantly affect the total estimates for the entire SIC code.

Transportation Equipment Industry, SIC Code 37

Results indicate that on-site waste management is rarely conducted in this industry. Also, when employed, facility estimates generally agreed with surveyor estimates, indicating that both the processes used and the chemicals managed cause less confusion than observed in SIC Codes 33 and 36.

Three of the 19 facilities surveyed reported a quantity greater than zero to on-site treatment. Site surveyors agreed within two percent of the estimated value and identified an additional facility that employed on-site treatment activities, but the quantity destroyed was less than 0.5 pounds.

On-site energy recovery was not reported or observed at these facilities.

On-site recycling was reported, and observed at two facilities. Site surveyors agreed with facility estimates in both cases.

6.4 Production Ratio/Activity Index

The production ratio/activity index is a chemical-specific measure of the changes in business activity between subsequent reporting years. The production ratio/activity index can be determined using the following methods:

- TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year;
- TCPV - the ratio of production volume in the current reporting year to the previous reporting year;
- TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year;
- HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year;
- WT - an activity index or production ratio based on a weighted average of data from several processes; and
- OTH - any other estimation method.

The site surveyors reviewed the method used by each facility for each Form R, and determined whether it was the most appropriate method to use based on the facility's available data. Figure 6-4 and Table 6-9 present by SIC code the distribution of the use of each method as reported by the facilities and by the site surveyors. The site surveyors recommended changes to the reported method for 25 of 157 (16%) Form Rs. The predominant method used by the

facilities and the surveyors for each SIC Code is TCPV followed by TCU. The RY 1996 result is consistent with the results of the data quality surveys previously conducted by EPA.

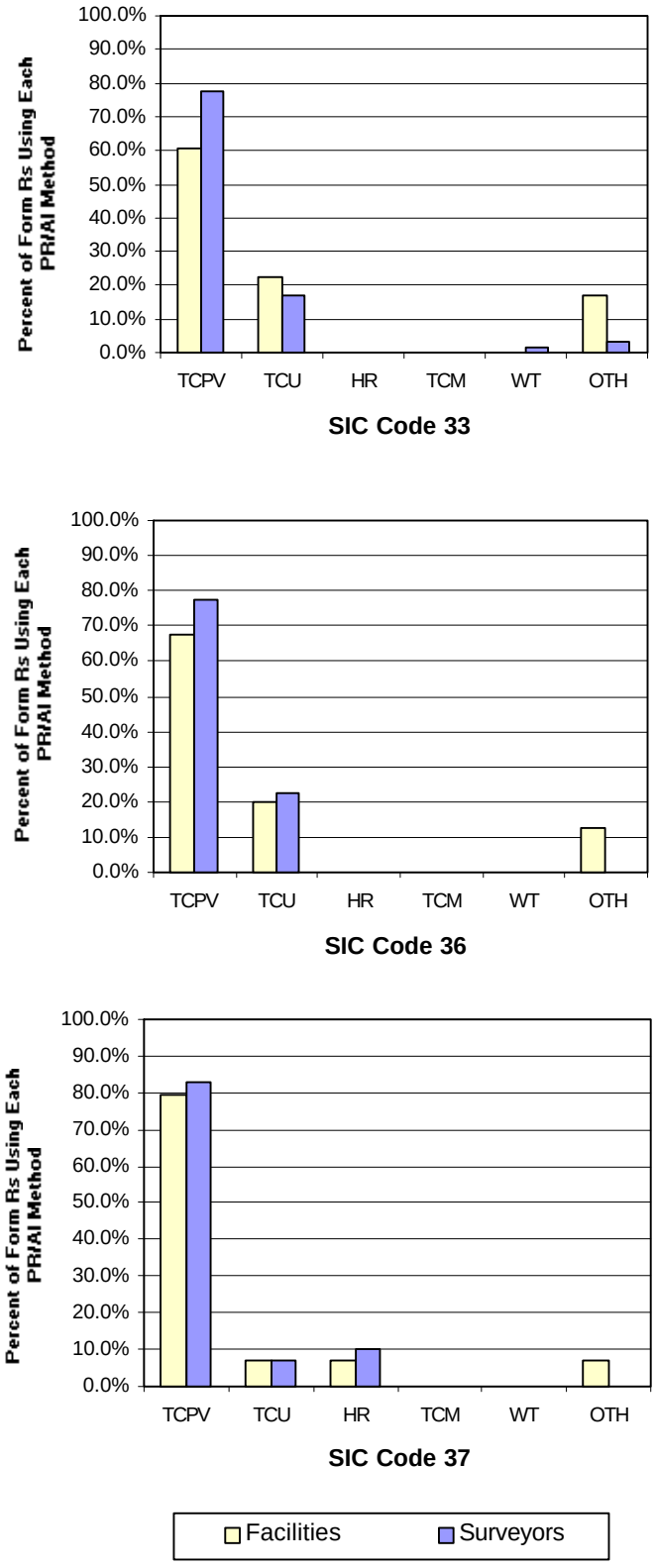
Table 6-9

Estimation Method Used by Facilities and Surveyors to Calculate Production Ratio/Activity Index

Method of Estimate	Percent of Form Rs Reviewed Using Each Method of Estimate					
	SIC Code 33		SIC Code 36		SIC Code 37	
	Facilities	Surveyors	Facilities	Surveyors	Facilities	Surveyors
TCM	0	0	0	0	0	0
TCPV	59	78	68	78	79	83
TCU	22	17	20	22	7	7
HR	0	0	0	0	7	10
WT	0	2	0	0	0	0
OTH	19	3	12	0	7	0

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.
TCPV - the ratio of production volume in the current reporting year to the previous reporting year.
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.
HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.
WT - an activity index or production ratio based on a weighted average of data from several processes.
OTH - any other estimation method.

Table 6-10 shows the frequency which the surveyors agreed with the facility's choice of method. It also provides explanations for the Form Rs where the surveyors disagreed with the facility's choice of method, and shows that the surveyors disagreed most often with the "other" basis of estimate. For only eight Form Rs (from four facilities), the surveyors thought that a defined method not used by the facility was more appropriate and/or accurate for determining the production ratio/activity index from the data available at the facility.



Data for this figure can be found on Table 6-6.

Figure 6-4. Estimation Method Used by Facilities and Surveyors to Calculate PR/AI

Table 6-10

Percent of Time Surveyor Agreed with Facility Basis of Production Ratio Estimate

SIC Code	Facility Basis of Estimate	Percent of Time Surveyor Agreed with Basis	Changes Made by Surveyor
33	TCPV	97	1 TCPV changed to WT
	TCU	77	3 TCU changed to TCPV
	OTH	18	2 OTH changed to TCPV because the facilities did not know how to calculate this value 5 OTH changed to TCPV because the facilities reported chemical release ratio of 1996 to 1995 1 OTH changed to TCPV because the facility reported the production ratio from 1995 to 1996
36	TCPV	100	Not applicable
	TCU	100	Not applicable
	OTH	0	4 OTH changed to TCPV because the facilities reported a ratio of projected sales for 1997 to 1996 sales 1 OTH changed to TCPV because the facility reported a ratio of sales for 1996 to sales for 1995
37	TCPV	100	Not applicable
	TCU	25	3 TCU changed to HR
	HR	75	1 HR changed to TCPV
	OTH	0	2 OTH changed to TCPV because the facilities reported a ratio of sales for 1996 to sales for 1995 1 OTH changed to TCU because the facility did not know how to calculate this value 1 OTH changed to TCPV because the facility did not know how to calculate this value

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.
TCPV - the ratio of production volume in the current reporting year to the previous reporting year.
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.
HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.
WT - an activity index or production ratio based on a weighted average of data from several processes.
OTH - any other estimation method.

Most (14 of 19) of the "other" responses were actually errors on the part of the facility, or their lack of knowledge of what this ratio was supposed to represent. Three of the "other" responses were based on the ratio of the facility's sales from 1996 to 1995. In each case these facilities had data available to calculate an activity index (the TCPV method), which the surveyors thought was more appropriate. Surveyors recommended changing all of the "other" responses except two. These two Form Rs (from the same facility) also used the ratio of the facility's sales from 1996 to 1995, but this ratio approximated the production volume for both chemicals.

A common error was that facilities used an activity index that was not specific to the processes involving the EPCRA 313 chemical. This was often seen when facilities based the ratio on total revenue, sometimes even including revenue from foreign sources.

Because many of the reporting errors for the production ratio/activity index were due to facilities not understanding the value or by calculating it using sales data, EPA can improve the accuracy of these values by preparing TRI reporting instructions that more clearly explain the ratio, including a numerical equation example, and by emphasizing that production-based data measures are preferred over sales data when available.

6.5 Source Reduction Activities

The following discussion reviews how accurately facilities report source reduction activities on Form Rs. Starting in RY 1991, EPA requested that facilities include on their Form Rs information describing source reduction activities implemented to reduce the quantity of EPCRA Section 313 chemicals in waste. This information provides the users of the data insight into the types and frequency of source reduction activities by industrial facilities. To assess the accuracy of source reduction entries in the TRI database, analyses in this section address the following three questions:

- Are the source reduction activities that facilities indicate on Form Rs legitimate?
- Why do facilities make errors when claiming source reduction?
- Do all facilities report source reduction activities on Form Rs?

Section 6.5.1 describes the source reduction activities reported for SIC Codes 33, 36, and 37. Section 6.5.2 presents the errors found by the surveyors and answers the preceding questions. Section 6.5.3 summarizes the findings and recommends ways to improve the accuracy of source reduction activity reporting. It should be noted that this section focuses only on source reduction activities that facilities indicate on Form Rs. Form As do not contain source reduction information.

6.5.1 Source Reduction Reporting

Table 6-11 summarizes how often source reduction activities were reported for EPCRA Section 313 chemicals. The data indicate that more source reduction was reported in the electronic and other electrical equipment industry (SIC Code 36) than the transportation equipment industry (SIC Code 37) or the primary metals industry (SIC Code 33). Compared to similar data from previous years, the RY 1996 results for the electronic and other electrical component industry was the largest value of reported source reduction on Form Rs surveyed (39%) of any SIC code previously included in an EPA data quality survey. The results for source reduction reporting in SIC Codes 33 and 37 (13% and 28%, respectively) were similar to the values reported for other SIC codes in other years.

Table 6-11

Frequency With Which Facilities Claimed Source Reduction Activities

SIC Code	Number of Facilities	Percent of Facilities Visited	Percent of Form Rs Submitted[a]	Total Number of Source Reduction Activities Claimed by Facilities
33	6	22	13	8
36	8	57	39	26
37	4	21	28	22

[a]Percents in this column were calculated using the weighting factors discussed in Section 2.6.

Table 6-12 shows the source reduction activities most commonly reported for each SIC code. A variety of responses were received for each SIC code, although raw material substitutions and process modifications account for most of the source reduction activities reported for each SIC code.

6.5.2 Errors Made When Claiming Source Reduction

To identify errors commonly made by facilities and reasons why facilities made these errors, site surveyors determined whether facilities indicated source reduction activities that were consistent with definitions of source reduction presented in the EPCRA Section 313 reporting instructions. In cases where facilities did not claim source reduction activities, site surveyors attempted to determine whether facilities overlooked source reduction activities. The rate of occurrence of errors in reporting source reduction activities and of not reporting source reduction activities is shown in Table 6-13. Only a few errors were identified in reporting source reduction activities. The percentage of errors found was lower than those found in previous EPA data quality surveys. This EPA data quality survey is the first that attempted to identify overlooked source reduction activities. Surveyors did find several overlooked source reduction activities.

Site surveyors disagreed with the source reduction activities reported for only five Form Rs (from two facilities). Three Form Rs, from one SIC Code 369 facility, reported a "change in operating practice" (Code W19) for three metal compound categories because they started re-melting scrap metal. This process is not source reduction because the facility is still processing the same amounts of metals, but now are just receiving some of them from a different source. Another Form R, from an SIC Code 371 facility, reported "other changes in inventory control" (Code W29) for dichloromethane because they improved their drum reconditioning activities. This same facility also reported "other spill and leak protection" (Code W39) because they added a vapor collection system above a process area to capture methanol fumes. This facility may be reducing the amount of dichloromethane and methanol in their waste, but not because of source reduction activities. The errors made by both of these facilities resulted from their not understanding exactly what activities constitute source reduction.

Table 6-12

Source Reduction Activities Claimed by the Surveyed Facilities

SIC Code	Source Reduction Code	Description	Percent of Form Rs That Correctly Used This Code
33	W14	Changed production schedule to minimize equipment changeovers	25.0
	W52	Modified manufacturing equipment and layout	25.0
	W13	Added a recordkeeping system for chemical additions to a bath	12.5
	W41	Increased purity of raw materials	12.5
	W55	Changed from small volume containers to bulk containers	12.5
	W82	Changed composition of raw materials	12.5
36	W58	Other process modifications	26.1
	W42	Substituted raw materials	21.6
	W52	Modified equipment, layout, or piping	21.6
	W19	Other changes in operating practices	8.7
	W13	Improved maintenance scheduling, recordkeeping, or procedures	4.4
	W41	Increased purity of raw materials	4.4
	W73	Substituted coating materials used	4.4
	W78	Other surface preparation and finishing modifications	4.4
	W82	Modified design or composition of product	4.4
37	W42	Reduced concentrations of reportable chemicals in raw materials	35.0
	W72	Modified spray systems	15.0
	W73	Substituted coating materials used	15.0
	W74	Improved application technique	15.0
	W19	Use fewer storage tanks and transfers for fewer emissions	5.0
	W49	Raw material modifications	5.0
	W52	Modified equipment layout or piping	5.0
	W58	Other process modifications	5.0

Table 6-13

Errors in Source Reduction Activity Classifications

SIC Code	Number of Errors in Source Reduction Activity Claims	Estimated Percent of Source Reduction Activities that are Claimed In error[a]	Approximate Number of Source Reduction Activities not Reported by the Selected Facilities	Estimated Percent of Source Reduction Activities that are not Reported[a]
33	0	0	7	11
36	3	12	0	0
37	2	9	4	7

[a] Percents in this column were calculated using the weighting factors discussed in Section 2.6.

The source reduction activities that the surveyors identified as not having been reported are summarized as follows:

- One SIC Code 33 facility had an ongoing effort to increase aluminum yield, and could have reported administrative source reduction activities (Code W13) for two chemicals;
- Two SIC Code 33 facilities modified their equipment (Code W52) and made other changes (Code W58), affecting several chemicals at each site;
- One SIC Code 37 facility could have reported source reduction for one chemical through use of a higher purity raw material (Code W41); and
- Three SIC Code 37 facilities replaced or closed a particular process and stopped using a particular chemical altogether, or eliminated a waste stream to a particular media (Codes W52, W58, or W61).

6.5.3 Overall Accuracy of Source Reduction Data

Site surveyors found that some facilities in the selected industries misinterpreted definitions of source reduction and should not have claimed all the source reduction activities that they did for RY 1996. Observations made by site surveyors suggest that some facilities did not claim legitimate source reduction activities on their Form Rs, but the current site survey data are insufficient for evaluating how often it occurs. The source reduction data in the TRI database

may not be completely accurate, however it does indicate that pollution prevention efforts are being considered by industries, and that the reporting of these activities is increasing.

Because the reporting errors of source reduction activities seem to be due to facilities misinterpreting definitions, EPA can help improve the accuracy of source reduction data by preparing TRI reporting instructions and guidance manuals that clearly define which activities are and are not considered to be source reduction.

7.0 PREPARATION OF THE FORM R

Site surveyors interviewed facility personnel during each site visit to obtain general information regarding completion of the EPCRA Section 313 reports (Form Rs or Form As) and to identify trends among the surveyed facilities. The information obtained during these interviews included quantitative information such as facility size (the number of employees at the facility), estimated time to complete the Form Rs, the types of personnel primarily responsible for preparing the Form Rs, and the types of references used by these personnel. In addition, the surveyors obtained qualitative feedback on the Form R Instructions, the Automated Form R (AFR), the TRI Hotline, use of the Form A, and suggestions for additional guidance that EPA should develop to assist facilities in estimating release and other waste management quantities and in preparing the Form Rs. Each of these topics is discussed in a subsection as follows:

- Section 7.1 - Facility Personnel and References;
- Section 7.2 - Amount of Time Needed to Prepare Form R Reports;
- Section 7.3 - Use of the Hotline;
- Section 7.4 - Comments on the Form R Instructions;
- Section 7.5 - Comments on the Automated Form R; and
- Section 7.6 - Comments on Use of the Form A.

7.1 Facility Personnel and References

Table 7-1 identifies the percentage of surveyed facilities by size (based on number of employees) for each SIC Code. The table indicates that most of the primary metals facilities (SIC Code 33) had fewer than 500 employees (an average of 190), while the electronic and other electrical equipment (SIC Code 36) and transportation equipment (SIC Code 37) facilities were evenly split between facilities with 50 to 499 employees and facilities with more than 500 employees.

Table 7-1

Number of Employees at Visited Facilities

Employee Range	Percentage of Visited Facilities with a Given Number of Employees		
	SIC Code 33	SIC Code 36	SIC Code 37
10-49 employees	22	0	11
50-499 employees	74	50	47
>500 employees	4	50	42
Number of Sites	27	14	19
Average Employees	190	690	710

Each facility was asked to identify the type of personnel responsible for completing the Form Rs from among the following choices:

- Facility Environmental - A full-time, on-site employee whose primary responsibility is dealing with environmental issues.
- Corporate Environmental - A person with environmentally-related responsibilities for more than one individual facility and may or may not be physically located at the visited facility.
- Facility Staff - An on-site employee whose responsibilities extend beyond the environmental area.
- Consultant/Contractor - Personnel contracted outside the company to prepare the facility's Form Rs.
- Safety Personnel - Similar employee to Facility Environmental but includes safety issues. This person may have responsibilities dealing with Environmental Health and Safety issues.
- Other - Anyone who completed the Form R that does not belong to one of the previously described staff types.

Table 7-2 lists the types of personnel responsible for preparing the Form Rs for each SIC Code. Both facility staff and facility environmental staff were common responses for SIC Code 33, while facility environmental staff (alone) was the most common response for SIC Codes

36 and 37. Consultants/contractors and facility staff were typically reported by smaller facilities (based on number of employees) across each SIC Code, while facility environmental staff was typically reported by larger facilities.

Table 7-2

Types of Personnel Completing the Form Rs

Staff Type	Percentage of Facilities Using Each Staff Type to Prepare The Form Rs[a]		
	SIC Code 33	SIC Code 36	SIC Code 37
Facility environmental	33	57	68
Corporate environmental	19	7	16
Facility staff	37	14	0
Consultant/contractor	15	29	16
Safety personnel	4	14	5
Other	7	0	5

[a]Totals may equal more than 100 percent due to facility personnel identifying themselves as more than one staff type.

Table 7-3 identifies the reference materials facilities most commonly used to prepare their Form Rs. All but two of the facilities visited used the TRI Reporting Form R instructions for RY 1996 and MSDSs to prepare their Form Rs. Many of the facility contacts had attended EPA-sponsored training workshops. The number of respondents that attended EPA-sponsored training workshops was much greater than reported in EPA's previous surveys. Facility use of other references is similar among the three SIC Codes. One difference between the SIC Codes is that SIC Code 36 commonly reported using EPA's *Estimating Releases and Waste Treatment Efficiencies for TRI (Green Book)* and *Industry Trade Association Materials*, while SIC Code 37 commonly reported the use of EPA's *Compilation of Air Pollutant Emission Factors Document (AP-42)*, use of privately sponsored seminar materials, and other resources.

Table 7-3

Common References Used to Complete the Form Rs

Reference	Percentage of Facilities Using a Particular Reference[a]		
	SIC Code 33	SIC Code 36	SIC Code 37
TRI reporting Form R instructions	93	100	100
Material safety data sheets	93	100	100
Estimating Releases and Waste Treatment Efficiencies for TRI (Green Book)	22	29	16
EPCRA Section 313 Release Reporting Guidance, Estimating Chemical Releases	7	7	16
Compilation of Air Pollution Emission Factors, AP-42	19	14	42
Industry trade association materials	19	29	16
Privately sponsored seminar materials	7	7	37
EPA-sponsored training workshop	33	29	53
Computer programs	15	21	37
Other references	22	7	32

[a]Totals may equal more than 100% as facilities often used more than one reference.

Eight facilities reported the use of other references that were not specifically identified in Table 7-3. These sources included supplier data, manufacturer's control efficiencies, hazardous waste manifests, non-AP-42 emission factors, Occupational Safety and Health Administration (OSHA) air sampling data, internal guidance from a corporate office, corporate seminars, EPA's TRI Question and Answer Document, and various software packages. Some of the software packages included MSDS tracking software, purchasing tracking software, chemical tracking software, internal spreadsheets, and named software packages such as OSHA-Soft, Wixel, HMMIS System, Reg Master, and Environmental Management Information System.

7.2 Amount Of Time Needed To Prepare Form Rs

Table 7-4 and Figure 7-1 show the number of hours required to collect the necessary data and complete all the Form Rs as reported by the facilities surveyed in RY 1996. Surveyors requested that the facility select one of five time period ranges (shown in Table 7-4). The time range reported by each facility was then divided by the total number of Form Rs filed by each facility to estimate the time required per Form R as shown in Table 7-5.

The estimates in Table 7-5 were calculated using the midpoint of each time range. Facilities that reported spending more than 100 hours provided an actual hour estimate which was used in the calculations. Therefore, these values can be compared to one another to identify differences between the SIC Codes, but are not necessarily an accurate estimate of the time required to complete each Form R. For example, if the upper end of each time range had been used to perform these calculations rather than the midpoint, the average time per Form R (across all facilities) is 24 hours rather than 18, as shown in Table 7-5. Table 7-5 discusses one particular data outlier: one SIC Code 371 facility reported a time of 200 hours per Form R which was more than double the next highest value in the database. Several estimates, as noted on Table 7-5, include and exclude this value. This SIC Code 371 facility reported this value because they believe they need to have someone key-enter MSDS information on a weekly basis to track their usage of EPCRA Section 313 chemicals.

For SIC Codes 33 and 36, Table 7-5 shows is that it takes more time per Form R for a facility to complete one Form R, compared to multiple Form Rs. These calculations were repeated (data not shown) and the same conclusions apply to facilities that complete “one or two” Form Rs, compared to more than two Form Rs. While this conclusion is reasonable, it does not appear to apply to SIC Code 37. Of the four SIC Code 37 facilities that filed only one Form R, all made one particular product. The remaining SIC Code 37 facilities made one or more products or were assembly lines handling hundreds of parts. The time each facility reported for completing Form R reports was similar. Thus, simple facilities making a limited number of products and those facilities making the same product(s) year after year may realize the same time efficiency in EPCRA Section 313 reporting as facilities submitting multiple Form Rs.

Table 7-4

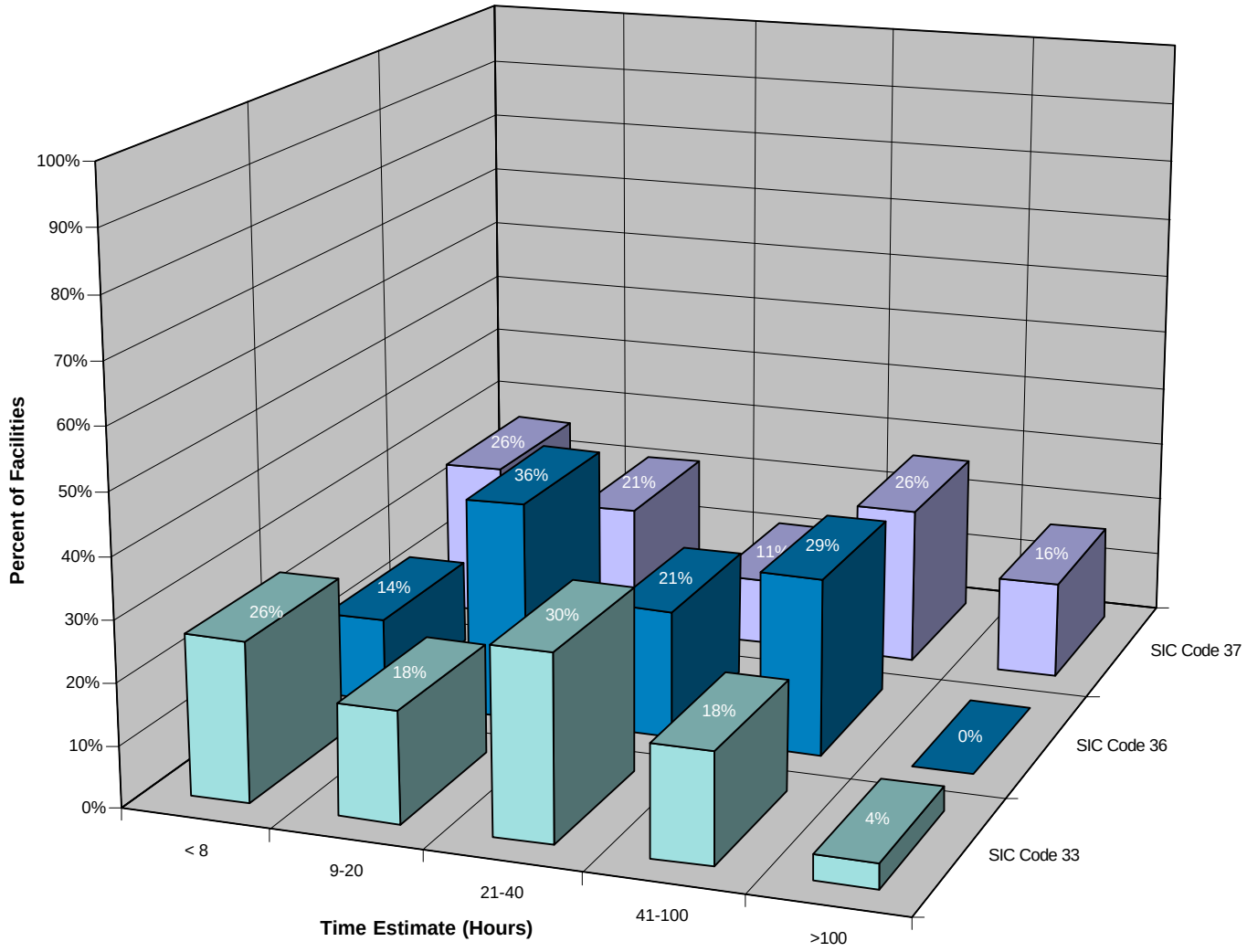
Number of Hours Required to Complete All Form Rs at Surveyed Facilities

Time Range Estimate	Percentage of Facilities		
	SIC Code 33	SIC Code 36	SIC Codes 37
≤8 hours	26	14	26
9-20 hours	18	36	21
21-40 hours	30	21	11
41-100 hours	18	29	26
>100 hours	4	0	16
Unknown	4	0	0

Table 7-5

Average Number of Hours Needed to Complete Each Form R

SIC Code	Data Subset	Time Estimate (Hours)
33, 36, 37	All data	18
33	All data	16
36	All data	16
37	All data	22
33, 36, 37	Facilities filing only 1 Form R	22
33, 36, 37	Facilities filing more than 1 Form R (with 1 outlier)	16
33, 36, 37	Facilities filing more than 1 Form R (without 1 outlier)	11
33	Facilities filing only 1 Form R	26
33	Facilities filing more Than 1 Form R	9
36	Facilities filing only 1 Form R	23
36	Facilities filing more than 1 Form R	10
37	Facilities filing only 1 Form R	9
37	Facilities filing more than 1 Form R (with 1 outlier)	25
37	Facilities filing more than 1 Form R (without 1 outlier)	12



May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 7-4.

Figure 7-1. Time Needed to Complete All Form Rs at Survey Facilities (SIC Codes 33, 36, and 37)

As indicated above, the average time needed per Form R is a function of the number of hours in the time range checked, and whether the midpoint or maximum of the range is used. However, the various time estimates listed in Table 7-5 represent an average range, and are significantly lower than the estimated average burden of 43 hours per Form R as listed in the Toxic Chemical Release Inventory Reporting Form R and Instructions for RY 1996.

7.3 Use of the Hotline

Of 60 facilities visited, 57% reported calling the EPCRA hotline for assistance in completing the Form Rs (although not necessarily about RY 1996). Figure 7-2 shows the percentage of visited facilities that called the hotline for the SIC Codes included in this analysis. Figure 7-2 indicates that personnel at about half of the primary metals facilities (SIC Code 33) called the hotline, and a greater percentage of the electronic and other electrical equipment (SIC Code 36) and transportation equipment facilities (SIC Code 37) called the hotline.

Most of the respondents in RY 1996 (85%) indicated that the hotline was helpful. However, two facilities stated that they had difficulty getting through to speak to an operator, and two other facilities stated that they received different answers from different operators. These same two complaints about the hotline were received during the analyses that EPA conducted for RY 1994 and RY 1995, in about the same frequency. One other facility commented that the hotline response was not helpful in RY 1995, but was helpful in RY 1996.

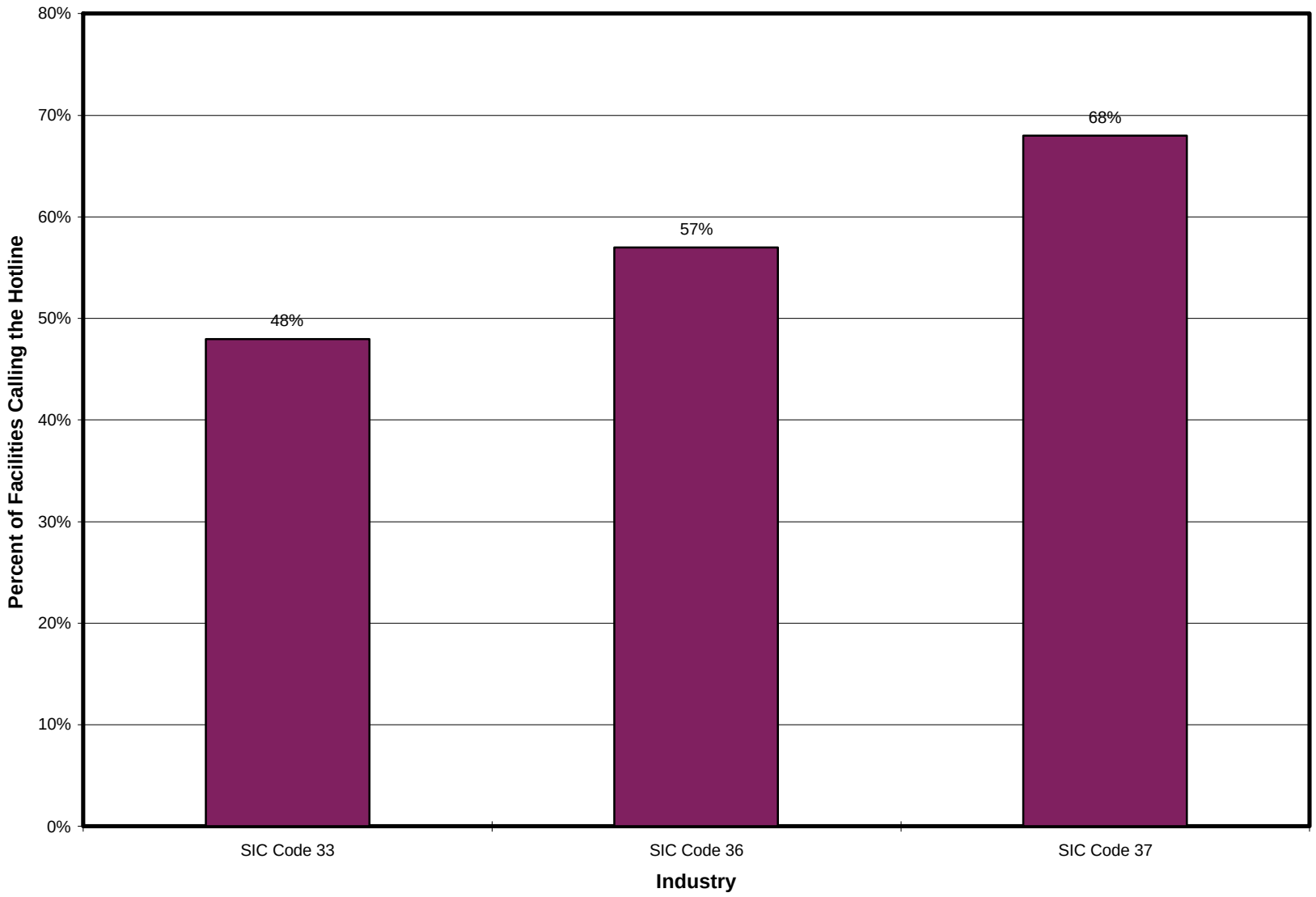


Figure 7-2. Percent of Facilities Calling the Hotline by Industry

7.4 Comments on the Form R Instructions and Guidance Manuals

Surveyors asked facility personnel for feedback on the Form R instructions, and for requests they may have for any additional guidance materials. Table 7-6 shows the number of respondents who identified a particular portion of the Form R instructions as unclear, for each SIC Code. The comments received were similar for each SIC Code.

Table 7-6
Comments on the Form R Chemical Specific Instructions

Subject Area	Number of Respondents Stating That a Particular Subject Area Was Unclear		
	SIC Code 33	SIC Code 36	SIC Code 37
Toxic chemical identity	0	0	0
Mixture component identity	0	0	1
Activities and uses of the toxic chemical	2	1	3
Releases to the environment on site	2	0	1
Transfers in waste to off-site locations	2	0	1
On-site waste treatment methods and efficiency and on-site energy recovery and recycling methods	1	0	3
Source reduction and recycling activities	0	1	1

General comments received about unclear portions of the Form R instructions are summarized below, with the number of facilities making each comment shown in parentheses. The list includes comments received from facilities in each SIC Code, and were not interpreted to be SIC-code specific. After the general comments are three separate lists, one for each SIC Code, of additional guidance materials that have been requested or comments on the Form R instructions that are SIC-code specific.

Unclear Areas of the Form R Instructions

- Definitions of manufacturing, processing, and otherwise use (4 facilities).
- The *de minimis* exemption (2 facilities).
- The article exemption (1 facility).
- The exemption for vehicles used on site (1 facility).
- The definitions of recycle versus reuse (5 facilities).
- The definition of metals versus metal compounds, e.g., nickel versus a nickel alloy (3 facilities).
- How to report metals entering POTWs (2 facilities).
- How to determine a facility's latitude and longitude (1 facility).
- The definition of an aerosol (1 facility).

SIC Code 33 - Primary Metals (RY 1996)

- Two facilities requested a guidance document that is industry specific (one was a steel manufacturer and the other was a foundry), and a third facility simply requested that more examples be presented.
- One facility suggested that EPA opinions be published as part of the guidance.
- One facility requested more information on which chemicals are in the glycol ethers category.

SIC Code 36 - Electronic and Other Electrical Equipment (RY 1996)

- One facility requested that EPA suggest methods (e.g., spreadsheet formats) for tracking EPCRA Section 313 chemicals used on site.
- One facility requested more guidance on estimating stormwater releases.
- One facility requested more guidance on estimating releases of acid aerosols (e.g., for hydrochloric acid).
- One facility requested that EPA release its instructions and guidance manuals in a more timely manner.

SIC Code 37 - Transportation Equipment (RY 1996)

- One facility suggested that the instructions contain less technical jargon; another facility requested "anything" to make the process simpler.

- One facility suggested that the instructions contain a list of references. Another facility requested that EPA explain where to find the answers to frequently asked questions. Another facility asked for a list of web sites (e.g., both EPA and environmental group web sites) that provide TRI information.

- One facility requested that more examples be included over a broader range of operations.

- One facility requested additional pollution prevention guidance.

- One facility requested a consistent method for estimating metal releases in stormwater.

- One facility requested that welding emission factors be published, with apportionments between different media categorized.

- One facility requested more guidance on emissions calculations.

- One facility requested, for EPA computer programs, that EPA write more easily understandable explanations of the program assumptions. A specific example was cited, the WIND program for estimating stockpile fugitive emissions.

7.5 Comments on the Automated Form R (AFR)

Sixty-three percent of the facilities surveyed for RY 1996 used the AFR to prepare their Form Rs. Two-thirds of the facilities that used the AFR stated that it was helpful, while one-third stated that it was not helpful. This information is shown in Figure 7-3.

The types of feedback received on the AFR are provided below. Every comment shown below was provided by more than one facility. Some of the comments, while described separately below (the way they were reported), may actually be different ways of describing the same problem.

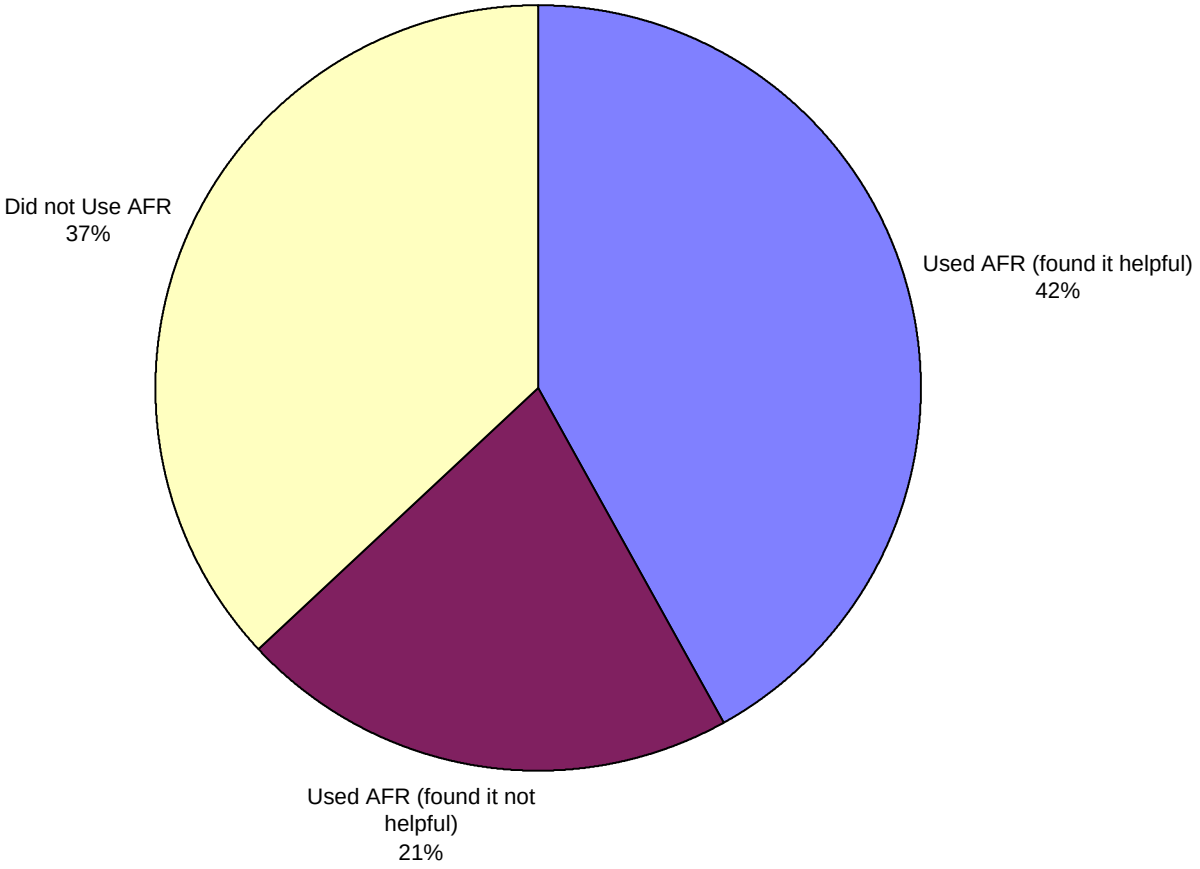


Figure 7-3. Percent of Facilities Using the Automated Form R

Positive AFR Comments

- Several facilities said the AFR is easy to use and saves typing time from year to year. Common data (such as facility name) are maintained from year to year and only the release information needs to be updated.

- Two commenters stated that the validation queries help reduce reporting errors, particularly in Section 8.

- Several commenters stated that the AFR software seems to be getting better with each release version.

Negative AFR Comments and AFR Suggestions

- Six facilities reported receiving diskettes for RY 1996 that were not readable, and therefore were not useable. One facility said they did not receive the AFR early enough in the year to use it; and that the AFR should be sent out earlier in the year.

- Several facilities said they had previously used a Windows version of the software, but they were mailed a DOS version this year. Most facilities did not want the DOS version and called the hotline to obtain a Windows version instead.

- Two facilities reported having problems installing the Windows version of the software for RY 1996; one of these facilities said it had worked better for RY 1997. One facility reported problems installing a Windows NT version of the software. One facility said that no information was available indicating that the AFR could not be loaded onto a computer on a network.

- Two facilities said that the Windows version of the software did not let them carry over data from the previous year (the opposite of the first positive statement made about the AFR).

- Five facilities reported that the software contains bugs but they did not elaborate. Many of the other bullets in this section probably explain some of these bugs. One facility said that they had technical problems with Sections 3.0 and 6.2 of the software. Another facility said that the AFR had switched some release totals around between reporting categories.

- Three facilities stated that the AFR would not let them report metals entering a POTW as a release for disposal; the software wanted to classify it as treatment.

- Two facilities said that the software would not let them enter NA in every place where they believed that NA was an acceptable response.

- One facility had a hard time entering extra off-site transfers. The software said releases to the environment and did not distinguish on site from off site releases. This site ended up double-counting these releases. Once submitted, the facility could not access the database to correct the mistake.

- One facility received a Notice of Significant Error because data that they put into the AFR were not transferred onto the printed reports created by the AFR.

- One facility suggested that more specific error analyses be included. This facility had left out an EPA identification number for a hazardous waste disposal site, but the error message they received simply said an error occurred in the previous section.

- One facility said that the AFR User Support Hotline voicemail is always full of messages, and is unable to receive any more messages.

- Several facilities had trouble printing their reports once they were finished, and some could not print the reports at all. One facility stated that 1) each AFR page was printed onto two separate pieces of paper and 2) some of the printed text was garbled. One facility said that it could not print the AFR Users Guide.

- One facility suggested that the printer selection section needs to be updated. New printers come out every year and the AFR printer selection list is not keeping up.

- One facility suggested that the program should have an easier way to exit, or abort, the program.

7.6 Comments on Use of the Form A

Five facilities surveyed for RY 1996 filed at least one Form A report. The surveyors agreed that three of these facilities had used the Form A correctly, but two of the facilities had used the Form A incorrectly. At least eight other facilities could have filed at least one Form A but did not. Three of these facilities did not know about the Form A. Five of these facilities knew about Form As, but chose instead to file Form Rs because it was more convenient. These facilities said that they had to do the same threshold, release, and other waste management calculations regardless of the form they filed, and recording their estimates on the Form R, a form they were already familiar with, would take less time by comparison than learning the requirements of the new Form A.

The Form A requirements have been discussed in the reporting instructions for the past two years. Some facilities have correctly learned these requirements and used the Form As. The Form A requirements are also being emphasized in the new industry-specific guidance manuals that EPA is now preparing.

8.0 RECOMMENDATIONS

This section presents several recommendations for the EPCRA Section 313 program based on the results and conclusions of the RY 1996 data quality assessment based on site surveys. Improvements in reporting guidance and in the reporting instructions, as well as facilities' experience in completing Form R reports for the previous reporting years will continue to improve the data quality in the TRI database. Recommendations for continued improvement of the TRI database are listed in the following subsections.

8.1 Additional Guidance Concerning Form R Instruction and Documentation

General recommendations noted by site surveyors for all SIC Codes include a section introducing and explaining the Question/Answer document and guidance documents currently available from EPA in the front of the TRI instructions. Many facilities and trade associations did not read the entire TRI instruction booklet and, therefore, were not aware these documents existed. Many facilities also requested a TRI guidance document specific to their industry. Facilities frequently requested a guidance document on foundry operations as well as one on metal and metal compounds reporting. Site contacts responsible for filling out EPCRA Section 313 reports mentioned that a readily available list of TRI Internet sites would also be helpful.

Facilities across all SIC Codes visited expressed concerns about the Automated Form R (AFR). Three of the facilities reported that the original diskettes they submitted to EPA were deemed "unreadable". Therefore, EPA issued a Notice of Technical Error. EPA and the facility eventually resolved the issue and in each case the facility re-sent the appropriate forms. None of these facilities received a confirmation letter from EPA. When site surveyors arrived on site with copies of information extracted from the TRI database, discrepancies existed between the TRI information and the information the facilities sent to EPA. This problem indicates a potential systematic error when corrected AFRs are sent to EPA.

Specific comments from facilities in each of the SIC Codes visited are as follows:

SIC Code 33 - Primary Metals Industry

- Better definitions are needed in order to distinguish between recycling and reuse.

- More examples and applicability guidelines are needed for the *de minimis* and article exemptions.

- Better definitions are needed of metals versus metal compounds, and EPA guidance should be available on which to report if both the metal and metal compounds exceed the threshold.

- Clearer instructions are needed in reporting metals in Section 7 and 8.6 of the Form R (on-site treatment). One issue in question is whether an air pollution control device removing dust containing the metal should be included as treatment (and if so, what efficiency to report since the metal is not destroyed but is removed from the gas stream). Specific examples should be given in this scenario when the toxic chemical has a "dust or fume" qualifier and/or when the metal dust collected is actually the product to be sold. Another issue related to on-site treatment is whether to report "0" or "N/A" in Section 8 when an on-site treatment unit is reported in Section 7.

SIC Code 36 - Electronic and Other Electrical Equipment

- Clear guidance is needed on whether HCl and H_2SO_4 acid aerosols should be reported as being treated (Section 7 and/or Section 8) if the chemical was simply removed from an air stream and incorporated into an aqueous stream. Facilities felt the current guidance in the reporting instructions was unclear.

- Clear guidance is needed on whether a chemical that is destroyed when it is used to treat other chemicals is considered to be treated itself. Facilities were unsure if, or how, Sections 7 and 8.6 should be completed in this situation.

- More information is requested on determining production ratio, specifically for those EPCRA Section 313 Chemicals produced as by-products or where the production ratio is determined by something other than the annual production ratio of the final product.

SIC Code 37 - Transportation Equipment

- Better documentation is requested when EPA delists a chemical, but includes it in a chemical category. A few facilities were tracking specific diisocyanate or glycol ether chemicals that were once on the EPCRA Section 313 list, but are now included in the diisocyanates or glycol ethers category instead of being listed separately. Facilities suggested leaving these chemicals in the EPCRA Section 313 with a note to include them in the chemical category instead.

- Better definitions are needed to distinguish between the minor category classifications (manufacturing aid vs. processing aid).

8.2 Additional Guidance Concerning Threshold Determinations

Although the nature and extent of threshold determinations varies from one industry to the next, some general lessons can be learned from the mistakes identified by the site surveyors. Table 8-1 lists common errors made by facilities when determining thresholds and offers several recommendations to avoid making such errors in the future. These recommendations may also be useful to EPA when developing future releases of TRI reporting instructions.

8.3 Additional Guidance Concerning Release Estimates

Table 8-2 lists common errors made by facilities in all SIC Codes surveyed when estimating release and other quantities managed as waste, and offers several recommendations to avoid making such errors in the future.

Table 8-1

Recommendations for Avoiding Errors in Threshold Determinations

Error Observed in Determining Thresholds	Recommendation for Avoiding Error in Future TRI Reporting Years
Facility did not document results of threshold determinations.	Reporting instructions should emphasize that documentation requirements apply to both threshold determinations and release and other waste management estimates.
Facility assumed EPCRA Section 313 chemicals exceeded thresholds, rather than calculating annual usages and comparing these amounts to reporting thresholds.	Facilities should be informed that assuming thresholds are exceeded, rather than calculating annual usages for EPCRA Section 313 chemicals, is a common source of errors in TRI reporting. Reporting instructions should encourage facilities not to assume thresholds are exceeded, even for chemicals used in very large or very small quantities.
Facility overlooked EPCRA Section 313 chemicals that were purchased in mixtures.	Facilities should carefully review the most recent MSDS for every mixture brought on site to identify all EPCRA Section 313 chemicals used during a reporting year.
Facility considered only raw materials used for production and overlooked chemicals used for other purposes.	Facilities should take a systematic approach to identify all chemicals and mixtures used in production and non-production capacities, including catalysts, underground injection well treatment chemicals, wastewater treatment chemicals, and the like.
Facility environmental staff was unaware that certain EPCRA Section 313 chemicals were used at the plant.	Facilities should implement measures, such as chemical usage logs or hazardous chemical inventories, to ensure that environmental staff are aware of all EPCRA Section 313 chemicals used in industrial applications.
Facility did not account for EPA's most recent threshold determination guidance.	EPA should enhance outreach efforts to ensure that all facilities are aware of revised reporting guidelines well in advance of submission deadlines.

Table 8-2

Recommendations for Avoiding Errors in Identifying Release and Other Waste Management Activity Types and Sources

Observed Error	Recommendation for Avoiding Error in Future TRI Reporting Years
Overlooked stack emissions from storage tanks, or reporting these emissions as fugitives.	Instructions should emphasize this potential release source and briefly discuss the definition of loading, working, and breathing losses from tanks (and the methodology to calculate them).
Overlooked container residue	Instructions should emphasize that even a "RCRA empty" drum is expected to contain a residual (possibly up to two inches) and that it must be considered for TRI reporting. Also, note that on-site drum rinsing and disposal of the rinsate will result in a discharge to water.
Overlooked acid aerosols manufacturing	Instructions should indicate that if H_2SO_4 or HCl is used anywhere in the plant as an aerosol, regardless of whether the process is enclosed or not, their usage should be applied to the threshold determination and release and other waste management calculations.
Incorrectly reporting disposition for off-site transfers	Instructions should emphasize that facilities should attempt to determine the type of receiving facility that is accepting the transfers and exactly how the material sent is being managed (or directly reused) by the receiving facility.
Questions on on-site recycling	Provide a definition of recycling and include examples of streams that can be considered as being recycled in Sections 7 and 8. An example would be used metals or metal compounds. Specifically, what waste management activity must be applied to a used metal for it to be considered recycled versus reused.
Definitions of source reduction	Consider shortening the list of codes for source reduction and providing definitions for each code.
Questions of on-site treatment of waste stream containing metals	Provide clarification of on-site treatment definitions pertaining to waste streams containing metals. Facilities completing Sections 7a and 8.6 of the Form R for metals are confused as to when treatment refers to collection versus actual destruction of a metal.

Table 8-2 (Continued)

Recommendations for Avoiding Errors in Identifying Release and Other Waste Management Activity Types and Sources

Observed Error	Recommendation for Avoiding Error in Future TRI Reporting Years
Confusion on energy recovery	Few facilities marked metals as going to energy recovery, either on-or off-site. The TRI Reporting Instructions should explicitly state that metals do not have a BTU value high enough for energy recovery, and should be marked as going to disposal or recycling.
Reporting releases as zero versus a range code representing a small amount	For air and water releases, standard guidance is needed on when it is reasonable to claim NA or zero versus "guessing a small amount" - range code A or B. (e.g. metal processed in amounts up to 10 pounds a year through furnaces, reactors, etc. Is it reasonable to claim zero or NA?) Standard guidance is needed for consistent release and other waste management estimates.
Questions on Section 8 amounts.	Facilities would like a simple formula for releases in each block of Section 8. (e.g., Section 8.1 = 5.1 + 5.2 + 5.3 + 5.4 + 5.5 + 6.2 (disposal only)). This will cut down on errors and double counting.
Clarification of the treatment definitions in Sections 7 and 8 of the Form R for organic and inorganic chemicals.	The definitions in the two sections are currently different, which can cause problems when reporting. Confusion occurs when: 1) chemicals go through a treatment system but are not destroyed. Facilities need direct guidance to claim zero efficiency, and then what to put in Section 8 (zero or NA); 2) facilities may report the amount sent to treatment versus the amount treated. Current guidance is confusing because facilities are supposed to report the amount sent to energy recovery and the amount sent to recycling, but not the amount sent to treatment (they should correctly report the amount treated instead).
Clarification on how to calculate production ratio for "processed" and "otherwise used" chemicals.	Facilities often used sales receipts or quantities released from year to year rather than an activity index that relates directly to the chemicals used.

9.0 REFERENCES

1) 1994 and 1995 Toxic Release Inventory Report, USEPA, March 1998

Appendix A

SURVEY INSTRUMENT

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

1997
(TRI REPORTING YEAR 1995)
TRI DATA QUALITY
SURVEY INSTRUMENT

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

FACILITY FACT SHEET

Date of Visit: _____ through _____

Facility Name: _____

Facility Address: _____

_____

City: _____

State: _____ Zip Code: _____

Mailing Address (if different from street address): _____

_____

Telephone: _____ Fax: _____

Facility Contact: _____

Site Surveyors: _____

_____

Pre-visit Telephone Contact: _____

Reviewers: _____

Facility ID: *_*_*_*_*_*_*_*_*-*_*_*_*

TELEPHONE CONTACT

TECHNICAL REVIEW

How many Form R (reporting year 1995) chemical reports were submitted for this facility?

_____

How many 313 chemicals were identified by this facility, but not reported, for reporting year 1995?

_____

3. <u>revised</u> Form R chemical reports for reporting year 1995?

☐ NO... *(Skip to Q.5)*

List the chemicals which had <u>revised</u>

_____

_____

_____

_____

5. Did the facility submit any withdrawal requests to EPA for the reporting year 1995?

☐ NO... *(Skip to Q.7)*

List the chemicals which had withdrawal requests.

_____ Approved Denied ☐

_____ ☐ Denied

_____ Approved ☐ ☐

_____ Approved Denied ☐

How many full-time equivalent employees did the facility have in 1995? _____

NOTE: If there were less than 10 full-time equivalent employees in 1995, do <u>not</u> visit this facility. Terminate

8. Briefly describe the industrial processes performed at this facility in 1995.

9. Has the facility's process operations significantly changed since 1995 (including equipment, chemicals, feedstock, etc.)?

YES.....☐ NO....☐ *(Skip to Q. 11)*

10. Briefly describe any process changes.

11. Has the facility implemented any new treatment, disposal, energy recovery, recycling or source reduction activities since 1995?

YES.....☐ NO.....☐ *(Skip to Q. 13)*

12. Briefly describe any new treatment, disposal, energy recovery, recycling or source reduction activities.

LOGISTICS

13. Will the facility be operating under typical conditions at the time of the visit?

YES....☐ NO.....☐

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

14. What personal protective equipment will be needed to participate in a facility tour?

Hard Hat ☐

Safety Boots ☐

Safety Glasses ☐

Respirator ☐

Other: _____

_____

15. How long is a typical tour? If unknown, how many square feet does the facility occupy? _____
(Consider this information when planning the type and duration of tour that would be most useful).

16. Hotel recommendation: _____

_____

17. Directions to facility: _____

_____

_____

_____

18. Time to meet: _____

19.1 Is a confidentiality agreement required to be completed for this facility?

YES...☐ NO....☐ *(Skip to Q. 20)*

19.2 Has a confidentiality agreement been completed?

YES...☐ NO....☐

20. Will the person who completed the Form R and all supporting materials be available during the site visit?

YES...☐ NO....☐ Alternate Contact: _____

21. Describe the type and quantity of supporting material available for the Form R calculations.

Facility ID: *_*_*_*_*_*_*_*_*-*_*_*_*

REPORT PREPARATION

1.1 *Check all that apply)*

Facility Environmental Staff . . . . . ☐

. . . . . ☐

. . . . . ☐

. . . . . ☐

. . . . . ☐

_____ ☐

Check all EPA documents and other references used to estimate releases and control efficiencies.

NONE.....

TRI Reporting Form R and Instructions, 1995 Version
(EPA 745-K-95-051) ☐

Estimating Releases and Waste Treatment Efficiencies for the TRI ("Green Book")
. . . . . ☐

EPA/560-4-88-004 a through q, Estimating Chemical Releases . . . . . .

Compilation of Air Pollution Emission Factors, AP-42 . . . . . .

Industry Trade Association Materials/Seminars . . . . . .

Privately Sponsored Seminar Materials . . . . . .

EPA-Sponsored Training Workshops . . . . . .

MSDSs . . . . . .

Computer Programs (list)_____ ☐

_____

Other _____ ☐

_____

_____

1.3 What is your estimate of the time needed to fulfill the reporting requirements of Section 313 for 1995? Please include familiarization with the regulation and reporting instructions, completion and internal review of the reporting forms, and documentation of all information in your reports.

≤ 8 Hours . . . . . ☐

9 - 20 Hours . . . . . ☐

21 - 40 Hours . . . . . ☐

41 - 100 Hours . . . . . ☐

> 100 Hours . . . . . ☐

1.4 Did you find the 1995 Form R reporting instructions useful?

YES.....☐ NO....☐

1.5 Did you feel any section of the instructions provided with the Form R were unclear?

YES....☐ NO.....☐ *(Go to Q. 1.6)* NA....☐ *(Skip to Q. 1.6)*

1.5.1 Check the appropriate section below and briefly explain the difficulty encountered.

Facility Reporting Determination . . . . . ☐

_____

_____

Part I. Facility Identification Information . . . . . ☐

_____

_____

*_*_*_*_*_*_*_*_*_*

Part II. Chemical Specific Information . . . . . .

1.
2.
3.
4.
5.
6.
7.

Recovery and Recycling Methods
Source Reduction and Recycling Activities

Did you call the Emergency Planning and Community Right-to-Know Hotline?

☐ ☐ *(Skip to Q.1.7)*

Did you find the operator's response helpful?

☐ ☐

1.7

R reports?

☐ ☐

Has EPA or your state ever contacted you with questions about any of the reported estimates

YES.... NO....

1.9

Technical Error from EPA or the state for any 1995 reports?

☐ ☐

Does the facility use any computer software to track toxic chemicals brought on site, used, or

YES.... NO....

If yes, identify: _____

1.11 Did you use the Automated Form R (AFR) electronic reporting to submit your Form Rs?

YES....☐ NO....☐ *(Skip to Q.1.12)*

1.11.1 Did you feel the AFR helped to reduce any errors on the Form R?

YES....☐ NO....☐

1.11.2 Describe any comments on the use of the AFR.

_____

_____

_____

_____

1.12 Are there additional guidance manuals that EPA should develop to provide more clarification on Form R reporting?

YES....☐ NO....☐

_____

_____

_____

_____

1.13 If a Form R was completed and the total annual reportable amount was less than 500 pounds, why did the facility <u>not</u> complete the short form for the alternate threshold reporting?

_____

_____

_____

_____

Facility ID: *_*_*_*-*_*_*_*-*_*_*

SECTION 2.0
INTRODUCTION AND FACILITY TOUR
(313 CHEMICALS PRESENT ON-SITE)

2.1 List all chemicals reported on the facility's Form R Chemical Reports.

Chemical Name	CAS #	Not a Section 313 Chemical
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐
______________________	*_*_*_*_*_*-*_*_*-*_*	☐

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

2.2 List all **Section 313** chemicals not reported on the facility's Form R chemical reports, but documented by the facility.

NONE....☐

Chemical Name	CAS #	Not a Section 313 Chemical
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐
_____	*_*_*_*_*_*-*_*_*-*_*	☐

2.3 List **ALL** other Section 313 chemicals not reported or documented, but identified by the surveyor during the site visit.

NONE....☐

Chemical Name	CAS #
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*
_____	*_*_*_*_*_*-*_*_*-*_*

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

2.4 List all mixtures identified during the facility tour which may contain Section 313 chemicals.

(a) Mixture Name	(b) Identify Section 313 Chemical Present	(c) Concentration of Chemical[1]	(d) Amount of Mixture Used in 1995[2]	(e) Amount of Section 313 Chemical Used[2]

[1]If concentration of chemical is below de minimis (0.1 wt.% for carcinogens, 1.0 wt.% for all others), do not include mixture in threshold determination.

[2] Complete columns d and e during threshold determination.

Process Diagram(s):

(identify release points **and chemicals**)

Treatment Unit, Disposal, Energy Recovery, Recycling or Source Reduction Operation(s):

(identify release points **and chemicals**)

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Facility Tour Notes:

Facility Tour Notes (Cont'd):

Chemical Name: _____ Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

CAS # *_*_*_*_*_*-*_*_*-*_*

SECTION 3.0
REVIEW OF THRESHOLD DETERMINATION

3.1 How is this chemical employed at the facility? *(Check all that apply)*

	Facility	Reviewer		Facility	Reviewer
3.1.1	☐	☐	**Manufacture**		
			a. Produced at the facility	☐	☐
			b. Imported by the facility	☐	☐
			c. For on-site use/processing	☐	☐
			d. For sale/distribution	☐	☐
			e. By-product	☐	☐
			f. Impurity[1] (% = ____)	☐	☐
3.1.2	☐	☐	**Process** *(incorporative activity)*		
			a. Chemical reactant (raw materials, intermediates, etc.)	☐	☐
			b. Formulation component	☐	☐
			c. Article component	☐	☐
			d. Repackaging	☐	☐

[1]If impurity is present below de minimis concentrations (0.1% for carcinogens, 1% for others), it is exempt from reporting.

	Facility	Reviewer		Facility	Reviewer
3.1.3	☐	☐	**Otherwise Use** *(nonincorporative activity)*		
			a. Chemical processing aid (added to reaction mixture)	☐	☐
			b. Manufacturing aid (process lubricants, coolants, etc.)	☐	☐
			c. Ancillary use (cleaners, degreasers, lubricants)	☐	☐
3.1.4	☐	☐	**Exempt Uses**		
			a. Used in laboratory activities	☐	☐
			b. Structural component	☐	☐
			c. Routine janitorial/facility grounds maintenance	☐	☐
			d. Personal employee use	☐	☐
			e. Motor vehicle maintenance	☐	☐
			f. Intake water component	☐	☐
			g. Contained in an article	☐	☐

3.2 Was the chemical reported by the facility?

YES....☐ *(Go to Q.3.3)* NO....☐

3.2.1 If no, why did the facility decide this chemical was not reportable?

a. Below threshold ..... ☐

b. Exempt ..... ☐

c. Overlooked chemical ..... ☐

d. Other (specify)_____ ☐

_____

3.3 Are all uses of the chemical exempt from reporting according to the surveyor or are all uses of the chemical a non-aerosol form of sulfuric acid or hydrochloric acid?

YES....☐ *(Go to Q.3.10)* NO....☐ (*Continue)*

3.4 **Does documentation which supports the threshold determination exist? (Documentation is defined as any type of data available at the facility in any form which can be used to recalculate the estimate)**

YES....☐ NO....☐

3.4.1 If no, why not?

a. Documentation cannot be located . . . . . ☐

b. Documentation was not retained by facility . . . . . ☐

c. Facility unaware that documentation is required . . . . . ☐

d. Facility overlooked the chemical *(Skip to Q.3.6)* . . . . . ☐

e. Other (specify) _____ . . . . . ☐

3.5 What was the basis of estimate used by the facility for the amount manufactured, processed, or otherwise used in 1995? *Check all that apply.*

a. Purchase/inventory records . . . . . ☐

b. Emission Factors . . . . . ☐

c. Mass balance . . . . . ☐

d. Assumed threshold exceeded (no calculations completed) . . . . . ☐

e. Process recipes . . . . . ☐

f. Monitoring data . . . . . ☐

g. Production data . . . . . ☐

h. Other (specify)_____ ☐

_____

Chemical Name: _____ Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

3.6 How much chemical did the facility manufacture, process, or otherwise use in 1995?[2]

		Facility	Reviewer
a.	Manufactured	_____ lbs	_____ lbs
b.	Processed	_____ lbs	_____ lbs
c.	Otherwise used	_____ lbs	_____ lbs

d. Facility did not estimate these quantities ..... ☐

3.7 Was the reviewer's estimate of the amount of chemical manufactured, processed, or otherwise used recalculated using available documentation or recreated using other facility data?

a. Recalculated, with no error ..... ☐

b. Recalculated, within a factor of 2 ..... ☐

c. Recalculated, within a factor of 10 ..... ☐

d. Recalculated, greater than a factor of 10 ..... ☐

e. Recreated, with no error ..... ☐

f. Recreated, within a factor of 2 ..... ☐

g. Recreated, within a factor of 10 ..... ☐

h. Recreated, greater than a factor of 10 ..... ☐

i. Facility did not estimate these quantities ..... ☐

3.8 Was a threshold exceeded for this chemical in 1995?

YES....☐ *(This chemical should have been reported. Continue)*

NO.....☐ *(This chemical should not have been reported. Skip to Q 3.10)*

[2]Record calculations and assumptions for the threshold determination on the worksheet in Section 6.0.

Chemical Name: _____ Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

3.10 This chemical was:

a. Correctly reported . . . . . (Go to Section 4.0) ☐

b. Correctly not reported . . . . . (Skip to next chemical) ☐

c. Incorrectly reported . . . . . (Go to Q.3.11) ☐

d. Incorrectly not reported . . . . . (Go to Q.3.12) ☐

3.11 Why was this chemical incorrectly reported?

a. Facility reported, although amount used was below threshold . . . . . ☐

b. Facility incorrectly assumed threshold was exceeded . . . . . ☐

c. Chemical activity was misclassified . . . . . ☐

d. Threshold quantity was miscalculated . . . . . ☐

e. Chemical was exempt . . . . . ☐

f. Chemical has been delisted/modified . . . . . ☐

g. Other (specify)_____ ☐

_____

(Skip to next chemical)

3.12 Why was this chemical incorrectly not reported?

a. **Chemical ~~activity~~ was overlooked** . . . . . ☐

b. Chemical activity was misclassified . . . . . ☐

c. Threshold quantity was miscalculated . . . . . ☐

d. Other (specify)_____ ☐

_____

(Continue to Section 4.0)

3.13 If the facility completed a short form for this chemical, are the releases less than 500 pounds?

YES....☐ *(Skip to the next chemical and document the release calculations)*

NO.....☐ *(Go to Section 4.0)*

SECTION 4.0

REVIEW OF RELEASE TYPES

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 4.1 Sources of Chemical Releases and Transfers

In the reviewers opinion, document whether or not the facility should have included releases from the following sources (1):

Chemical Name _____ **CAS #** *_*_*_*_*_*-*_*_*-*_*	**Fugitive Air**	**Stack Air**	**Receiving Stream**	**Under-Ground Injection**	**Land On-Site**	**POTW**	**Off-Site Transfer**
SOURCE A. ~~Process vents/stacks~~							
B. Pumps/valves/flanges							
C. Volatilization from process areas							
D. Volatilization from treatment areas							
E. Storage tank/stock pile losses							
F. Accidental spills/releases							
G. Waste treatment discharge streams							
H. Stormwater runoff							
I. Process discharge streams							
J. Housekeeping practices/clean-up wastes (i.e., solvent)							
K. Container residue							
L. Treatment sludges, recycling or energy recovery by-products							
M. Combustion by-products							
N. Other _____							

NOTE: COMPLETE ALL ROWS AND COLUMNS.

<u>If a Form R was completed</u>:

(1) Y = Yes, release source should be included in release estimate that surveyor calculates in Section 5 and facility identified this release type.

N = No, release should be included in release estimate but facility overlooked this release type.

NA = This source was not present at the facility for this chemical

<u>If a Form R was not completed</u> (overlooked chemical):

Y = Release source should be included

NA = Release source was not present at the facility for this chemical

SECTION 4.2 (a) and (b)

CODE LIST

Q1

Y	=	Yes
N	=	No
NA	=	Facility overlooked this chemical

Q2

FE	=	Fugitive air
PS	=	Stack air
RS	=	Receiving stream
UI	=	Underground injection
LA	=	Land on site
PW	=	POTW
TOSD	=	Off-site transfer (disposal)
TOST	=	Off-site transfer (treatment)
TOSR	=	Off-site transfer (recycling)
TOSE	=	Off-site transfer (energy recovery)
NA	=	Facility does not have a release to this medium

Q3

Y	=	Yes
N	=	No
NA	=	Facility overlooked this chemical

Q4

FES	=	Releases are only fugitive releases and are not released to a stack.
SFE	=	Releases are to a stack and not released as fugitives.
VPC	=	Chemical is a volatile organic chemical (VOC) and was not reported as an air release.
ACID	=	Mineral acids, which were neutralized, were included.
POTW	=	Wastewater discharge is to a POTW and not a receiving stream.
RECS	=	Wastewater discharge is to a receiving stream and not to a POTW.
ONLAND	=	Releases are to an on-site landfill, not to an off-site landfill.
OFFLAND	=	Releases are to an off-site landfill, not to an on-site landfill.
NOER	=	Off-site energy recovery does not take place in a legitimate energy recovery system.
NOCOMB	=	Toxic chemical does not have a heating value high enough to sustain combustion.
NR	=	Site visit concluded that chemical is not released to this medium.
OTH	=	Other _____
NA	=	Facility correctly identified release type or facility overlooked chemical

CODE LIST (Continued)

Q5	Y	=	Yes
	Y1	=	Yes, but facility incorrectly identified release type
	Y2	=	Yes, but documentation is unclear or incomplete
	N1	=	Documentation cannot be located
	N2	=	Documentation was not retained by facility
	N3	=	Facility unaware that documentation required
	N4	=	Facility overlooked chemical
	N5	=	Facility overlooked this release type
	N6	=	Other _____
	NA	=	Facility does not have a release for this medium
~~Q6~~	~~Y~~	~~=~~	~~Yes~~
	~~N1~~	~~=~~	~~Facility unable to locate data~~
	~~N2~~	~~=~~	~~Facility did not retain data~~
	~~NA~~	~~=~~	~~Monitoring data not used~~
Q7	1	=	Facility derived factors
	2	=	EPA published emission factors
	3	=	Trade association factors
	4	=	Other _____
	NA	=	Emission factors not used
~~Q8~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No~~
~~Q9~~	~~Y~~	~~=~~	~~Yes~~
	~~N1~~	~~=~~	~~Facility misinterpreted de minimis rule~~
	~~N2~~	~~=~~	~~Other _____~~
	~~NA~~	~~=~~	~~Facility does not have de minimis wastestreams~~
~~Q10~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No, facility overlooked treatment~~
	~~NA~~	~~=~~	~~No on-site treatment of this chemical for this release medium occurred~~
~~Q11~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No~~
	~~NA~~	~~=~~	~~No treatment efficiencies were not used~~
Q12	Y	=	Yes
	N	=	No
	NA	=	Facility does not have a release for this medium
Q13	MP	=	Spent metal plating bath
	CW	=	Cleaning waste
	WTS	=	Waste treatment sludge
	SC	=	Spent catalyst
	SPS	=	Spent process solvent
	OTH	=	Other: _____ _____
	NA	=	Facility does not have recycling releases

Note: This code list refers to the questions for the Section 4.2(a) and (b) table on page 27 and 28.

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 4.2a Review of Release Types (On-Site Releases)

Chemical Name _____ **CAS # *_*_*_*_*_*-*_*_*-*_***	**Fugitive Air §5.1**	**Stack Air §5.2**	**Receiving Stream §5.3**	**Underground Injection §5.4**	**Land On Site §5.5**
1. Did the facility identify a release type on the Form R?					
2. Enter surveyor's release types.					
3. Did the facility correctly identify the release type?					
4. If Q.3 is NO, identify the reason that the release type was incorrectly identified, otherwise enter NA.					
5. Is documentation on the facility's release estimate available for review?					
IF Q.5 IS NO OR NA, SKIP TO QUESTION 12					
6. If monitoring data were used, is it available for review?					
7. If emission factors were used, what is the source of the factors?					
8. Was each air or waste stream counted only once in release estimates? (1)					
9. Were all air or waste streams containing ≥1% or ≥0.1% (carcinogens) of the chemical included in release calculations?					
10. Was on-site treatment of this chemical included in release estimates?					
11. Were treatment efficiencies reported consistent with measurement data, vendor specs, or EPA-published efficiencies? (2)					
12. Does the facility have information available to estimate the amount of this chemical released during 1995?					

~~(1) If no, document all streams double counted in release calculations in Section 6.0~~
~~(2) If no, document inconsistency of treatment efficiencies used in Section 6.0~~

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 4.2b Review of Release Types (Off-Site)

Chemical Name _____ **CAS #** *_*_*_*_*_*_*-*_*_*-*_*	**POTW §6.1**	**Off-Site Transfer (disposal) §6.2**	**Off-Site Transfer (treatment) §6.2**	**Off-Site Transfer (recycling) §6.2**	**Off-Site Transfer (energy recovery) §6.2**
1. Did the facility identify a release type on the Form R?					
2. Enter surveyor's release types.					
3. Did the facility correctly identify the release type?					
4. If Q.3 is NO, identify the reason that the release type was incorrectly identified, otherwise enter NA.					
5. Is documentation on the facility's release estimate available for review?					
IF Q.5 IS NO OR NA, SKIP TO QUESTION 12					
6. If monitoring data were used, is it available for review?					
7. If emission factors were used, what is the source of the factors?					
8. Was each air or waste stream counted only once in release estimates? (1)					
9. Were all air or waste streams containing ≥1% or ≥0.1% (carcinogens) of the chemical included in release calculations?					
10. Was on-site treatment of this chemical included in release estimates?					
11. Were treatment efficiencies reported consistent with measurement data, vendor specs, or EPA-published efficiencies? (2)					
12. Does the facility have information available to estimate the amount of this chemical released during 1995?					
13. If appropriate, characterize the recycling stream (*use multiple codes if necessary*).					

~~(1) If no, document all streams double counted in release calculations in Section 6.0~~
~~(2) If no, document inconsistency of treatment efficiencies used in Section 6.0~~

Section 4.2c Review of Release Types (On-Site Treatment, Energy Recovery or Recycling)

Chemical Name _____ **CAS #** *_*_*_*_*_*_*-*_*_*-*_*	**On-Site Treatment (§7A or 8.6B)**	**On-Site Energy Recovery (§7B or 8.2B)**	**On-Site Recycling (§7C or 8.4B)**
1. Did the facility identify an on-site treatment, energy recovery, or recycling method in §7 on the Form R? (1)			
2. Enter surveyor's identification of on-site methods. (2)			
3. Did the facility correctly identify the on-site method? (1)			
4. If Q.3 is NO, identify the reason that the method was incorrectly identified, otherwise enter NA. (3)			
5. For on-site treatment in §8.6B, did the facility only report the quantity of chemical destroyed during treatment? (4)			
6. For on-site recycling in §8.4B, did the facility report the quantity of chemical recovered from recycling? (4)			
7. If appropriate, characterize the recycling stream (*use multiple codes if necessary*): (5)			
8. Describe the type of recycling unit: (6)			

(1)
- Y = Yes
- N = No
- NA = Facility overlooked this chemical

(2)
- TR = On-site treatment
- ER = On-site energy recovery
- REC = On-site recycling
- NA = Facility does not use this on-site method

(3)
- OFFLAND = Releases are to an off-site landfill, not an on-site landfill
- NOER = Off-site energy recovery does not take place in a legitimate energy recovery system
- NOCOMB = Toxic chemical does not have a heating value high enough to sustain combustion
- NR = Toxic chemical is not recycled
- OTH = Other: _____
- NA = Facility correctly identified on-site method or facility overlooked chemical.

(4)
- Y = Yes
- N = No
- NA = Facility did not identify this on-site method

(5)
- MP = Spent metal plating bath
- CW = Cleaning waste
- WTS = Waste treatment sludge
- SC = Spent catalyst
- SPS = Spent process solvent
- OTH = Other: _____
- NA = Facility did not estimate recycling releases

(6) Identify type of on-site recycling unit used. See §7.C of Form R.

SECTION 5.0

REVIEW OF RELEASE ESTIMATES

Section 5.1 Review of Release Estimates (On-Site Releases)

For each on-site release identified in Section 4.2a (Question 2), complete the following table:

Chemical Name _____ **CAS # *_*_*_*_*_*-*_*_*-*_***	**Fugitive Air §5.1**	**Stack Air §5.2**	**Receiving Stream §5.3**	**Underground Injection §5.4**	**Land On Site §5.5**
1. Enter facility's release estimate (in lbs) (1)	A B C	A B C	A B C	A B C	A B C
2. What method(s) did the facility use to estimate their release? (2)					
3. Based on data available to the facility, is this the most accurate method to determine a release estimate? (3)					
IF Q.3 IS YES, SKIP TO QUESTION 6					
4. What is a better method(s) which could be used to calculate a more accurate release estimate? (2) (4)					
5. Enter the reviewer's release estimate using a more accurate method(s) (5)	A B C	A B C	A B C	A B C	A B C
6. Enter the reviewer's release estimate using the same method(s) as the facility. (5)	A B C	A B C	A B C	A B C	A B C

(1) Range Codes:
- A = 1-10 lbs
- B = 11-499 lbs
- C = 500-999 lbs
- N1 = Release estimate was not included on Form R but should have been, skip to Question 4
- N2 = Facility overlooked this chemical, skip to Question 4
- NA = Facility does not have a release to this medium, do not continue with this medium
- **N3 = Release estimate was included but should not have been, do not continue with this medium but enter facility release (i.e, N3, 100)**

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations **("minor calcs")**
- OJ = Engineering judgement **("guess")**
- OH = Hazardous waste manifests
- O = Other _____
- NA = Facility did not estimate release

(3)
- Y = Yes
- N = No

(4) Document why this method is more accurate in Section 6.0

(5) NA = Facility did not estimate release
[Note: Enter the number that was calculated. Only enter a range, if a range is the most accurate quantity that can be calculated.]
Document release calculations in Section 6.0

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 5.2 Review of Release Estimates (Off-Site)

For each off-site release identified in Section 4.2b (Question 2), complete the following table:

Chemical Name _____ **CAS # *_*_*_*_*_*_*-*_*_*-*_***	**POTW §6.1**	**Off-Site Transfer (disposal) §6.2**	**Off-Site Transfer (treatment) §6.2**	**Off-Site Transfer (recycling) §6.2**	**Off-Site Transfer (energy recovery) §6.2**
1. Enter facility's release estimate (in lbs) (1)	A B C	A B C	A B C	A B C	A B C
2. What method(s) did the facility use to estimate their release? (2)					
3. Based on data available to the facility, is this the most accurate method to determine a release estimate? (3)					
IF Q.3 IS YES, SKIP TO QUESTION 6					
4. What is a better method(s) which could be used to calculate a more accurate release estimate? (2) (4)					
5. Enter the reviewer's release estimate using a more accurate method(s) (5)	A B C	A B C	A B C	A B C	A B C
6. Enter the reviewer's release estimate using the same method(s) as the facility. (5)	A B C	A B C	A B C	A B C	A B C

(1) Range Codes:
- A = 1-10 lbs
- B = 11-499 lbs
- C = 500-999 lbs
- N1 = Release estimate was not included on Form R but should have been, skip to Question 4
- N2 = Facility overlooked this chemical, skip to Question 4
- NA = Facility does not have a release to this medium, do not continue with this medium

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations **("minor calcs")**
- OJ = Engineering judgement **("guess")**
- OH = Hazardous waste manifests
- O = Other _____
- NA = Facility did not estimate release

(3)
- Y = Yes
- N = No

(4) Document why this method is more accurate in Section 6.0

(5) NA = Facility did not estimate release
[Note: Enter the number that was calculated. Only enter a range, if a range is the most accurate quantity that can be calculated.]
Document release calculations in Section 6.0

Section 5.3 Review of Form R §8 Data (On-Site Releases or Off-Site Transfers)

Chemical Name _____ **CAS #** *_*_*_*_*_*_*-*_*_*-*_*	**Quantity Released §8.1B**	**Quantity Used for Energy Recovery Off Site §8.3B**	**Quantity Recycled Off Site §8.5B**	**Quantity Treated Off Site §8.7B**
1. Enter facility's estimate from §8, Column B, on the Form R. (*Enter NA if facility did not estimate*)				
2. Enter facility's basis of estimate. (1)				
3. Calculate the quantity released or transferred using the method in footnote (2).				
4. Are the facility's estimate (Q.1) and the quantity released or transferred from Q.3 the same? (3)				
5. If Q.4 is NO, provide notes or an explanation detailing any differences in the calculation of Section 8 data.				

(1) TECH = Used the following technique:

- Form R §8.1B = [§5.1 + §5.2 + §5.3 + §5.4 + §5.5 + §6.2 (disposal only) - §8.8]
- Form R §8.3B = §6.2 (energy recovery only) - §8.8
- Form R §8.5B = §6.2 (recycled only) - §8.8
- Form R §8.7B = §6.1 + §6.2 (treated only) - §8.8

NOBASE = Data for Section 8 was estimated, basis not provided
OTH = Other: _____
_____

NA = Facility did not estimate; **do not continue with this medium**.

(2) [Note: Use the best release estimate from Section 5.1 and 5.2 of this survey to calculate these quantities.]
Document the calculations in Section 6.0.

(3) Y = Yes
N = No
NA = Facility did not estimate

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 5.4 Review of Form R §8 Data (On-Site Treatment, Energy Recovery, or Recycling)

For the on-site treatment or energy recovery method(s) identified in Section 4.2c (Question 2), complete the following table. Only recreate on-site recycling estimates that were provided by the facility. Do not estimate on-site recycling releases NOT identified by the facility.

Chemical Name _____ **CAS #** *_*_*_*_*_*-*_*_*-*_*	**On-Site Treatment (§7A or 8.6B)**	**On-Site Energy Recovery (§7B or 8.2B)**	**On-Site Recycling (§7C or 8.4B)**
1. Enter the facility's estimate of quantity from §8, Column B, of the Form R. (1)			
2. What method did the facility use to estimate the amount treated, sent to energy recovery, or recovered from recycling? (2)			
3. Based on data available to the facility, is this the most accurate method to estimate the amount treated, sent to energy recovery, or recovered from recycling? (3)			
IF Q.3 IS YES, SKIP TO QUESTION 6			
4. What is a better method which could be used to calculate a more accurate estimate? (2)			
5. Enter the reviewer's estimate using a more accurate method. (4)			
6. Enter the reviewer's estimate using the same method. (4)			

(1)
- N1 = Estimate was not included on Form R but should have been, skip to Question 4.
- N2 = Facility overlooked this chemical, skip to Question 4.
- NA = Facility does not have this on-site method, **do not continue with this medium**.

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations
- OJ = Engineering judgement
- OH = Hazardous waste manifests
- O = Other _____
- NA = Facility did not estimate quantities for this on-site method

Document the method used by the facility and/or alternate methods used in Section 6.0

(3)
- Y = Yes
- N = No
- NA = Facility does not have this on-site method

(4)
Document calculations in Section 6.0.
NA = Facility did not estimate release.

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

Section 5.5 Review of Form R §8 Data
(Production Ratio/Activity Index and Source Reduction Activities)

Chemical Name _____ **CAS #** *_*_*_*_*_*-*_*_*-*_* **Production Ratio/Activity Index**	**Production Ratio/Activity Index (§8.9) and Source Reduction Activities (§8.10)**		
1. Enter the facility's estimate from §8.9 of the Form R. (Enter NO if facility did not estimate)			
2. Enter facility's basis of estimate (1).			
3a. Is this estimate based on a variable that most directly affects the quantities of the toxic chemical generated as **"waste"** quantities? (2)	3a.		
3b. If Q.3a is NO, enter surveyor's choice for alternate basis.	3b.		
Source Reduction Activities	**Activity #1**	**Activity #2**	**Activity #3**
4a. Enter the source reduction activity codes from Section 8.10 of the Form R.	4a-1.	4a-2.	4a-3.
4b. Provide a text description of the source reduction activity.	4b-1.	4b-2.	4b-3.
4c. Is this activity "source reduction" (i.e., not recycling, treatment, energy recovery, or disposal) (2)?	4c-1.	4c-2.	4c-3.

(1)

TCM = Ratio of amount of the toxic chemical manufactured in 1995 to 1993
TCPV = Ratio of production volume in 1995 to 1993
TCU = An activity index of the amount of toxic chemical used in 1995 to 1993
HR = An activity index of the amount of operating hours for an activity in 1995 to 1993
WT = An activity index or production ratio based on a weighted average of data from several processes
OTH = Other: _____

NA = The manufacture or use of the chemical began in 1995.

(2)

Y = Yes
N = No

SECTION 6.0

CALCULATION WORKSHEETS

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

THRESHOLD DETERMINATION WORKSHEET

Chemical Name: _____

Description of Use	Amount Manufactured	Amount Processed	Amount Otherwise Used
TOTALS			

Calculations:

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

~~MAXIMUM AMOUNT ONSITE WORKSHEET~~

~~Chemical Name: _____~~

~~INSTRUCTIONS:~~ ~~*Calculate the maximum amount of the chemical onsite at any one time during the reporting year. Keep in mind the following:*~~

- ~~*All storage areas where this chemical may be kept;*~~
- ~~*The amount of chemical being used at any time; and*~~
- ~~*The amount of chemical in each waste stream.*~~

Storage Areas:

Total: _____

Chemical in Use:

Total: _____

Chemical in Waste Streams:

Total: _____

Total On-Site: _____

Facility ID: *_*_*_*-*_*_*_*-*_*_*_*

RELEASE ESTIMATE WORKSHEET

Chemical Name: _____ Release Type _____

CAS # *_*_*_*_*_*_*-*_*_*-*_* SI Page # _____ Question # _____

INSTRUCTIONS: *Record all calculations for release estimates below. ~~in the appropriate sections.~~ Be sure to identify if calculations use the same method as the facility or a more accurate method.*

Appendix B